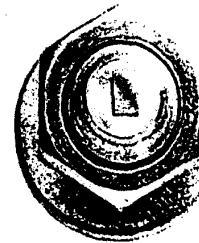
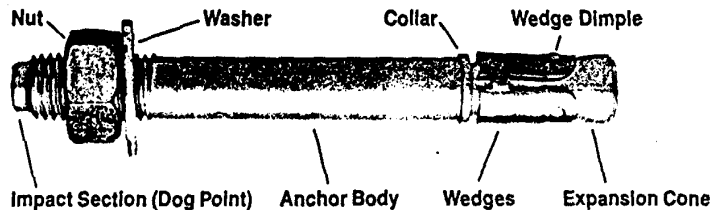


HILTI, INC. - Example #1

The Hilti Kwik Bolt II

Product Details



Length Identification

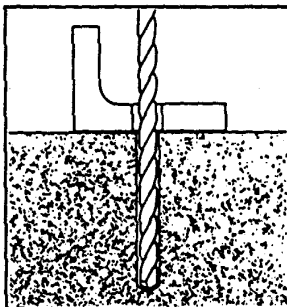
The Kwik Bolt II is a stud type expansion anchor with a single piece wedge that performs as three independent wedges if necessary to ensure consistent performance in a wide variety of medium-duty applications.

Kwik-Bolt Length Identification System

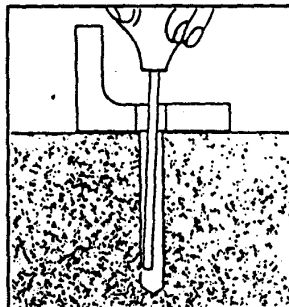
| Stamp on Anchor | | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---------------------------|-------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | From | 1½ | 2 | 2½ | 3 | 3½ | 4 | 4½ | 5 | 5½ | 6 | 6½ | 7 | 7½ | 8 | 8½ | 9 | 9½ | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| Length of Anchor (Inches) | Up To But Not Including | 2 | 2½ | 3 | 3½ | 4 | 4½ | 5 | 5½ | 6 | 6½ | 7 | 7½ | 8 | 8½ | 9 | 9½ | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |

| Stamp on Anchor | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|---------------------------|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|
| From | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | | | | |
| Length of Anchor (Inches) | Up To | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | | | |

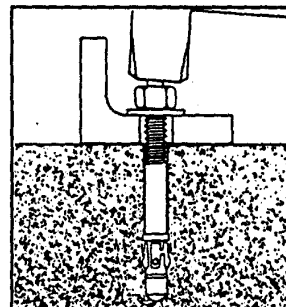
Kwik Bolt II Installation Instructions



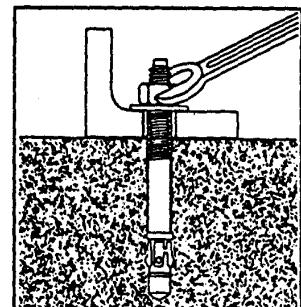
1. Simply hammer drill a hole same nominal diameter as Hilti KWIK BOLT-II, with or without the fixture in place — KWIK BOLT-II works in a "bottomless" hole.



2. Clean hole with Blow Out Bulb.



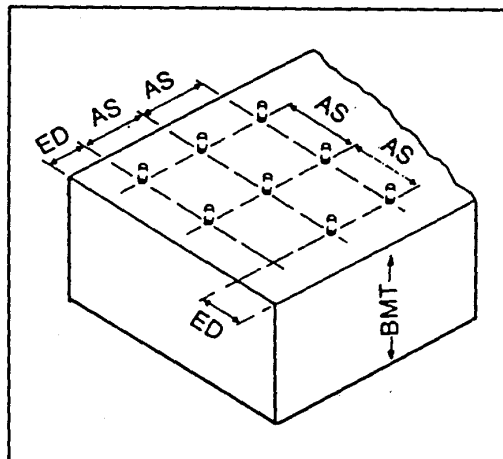
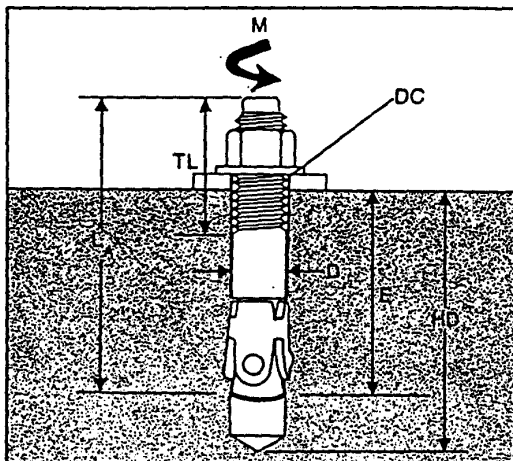
3. Drive the Hilti KWIK BOLT-II far enough into the hole so that at least six threads are below the top surface of the fixture, using a Hilti 2 lb. hammer.



4. Tighten to the recommended torque value with a torque wrench, or if torque wrench is not available 2 to 3 turns from the finger tight position to achieve proper anchor setting.

HILTI, INC. - Example #2

Specification Table



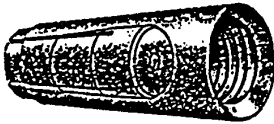
| Setting Details | | | | Anchor size | | | | | |
|----------------------------------|-------------------------------------------------------------------|-----------------|-------------|-----------------------------------------|-------------------|---------------|-------------------------|-------------------------|------------------|
| | | | | HKB 1/4" | HKB 3/8" | HKB 1/2" | HKB 5/8" | HKB 3/4" | HKB 1" |
| BD = D | drill bit size = anchor diameter | | | 1/4" | 3/8" | 1/2" | 5/8" | 3/4" | 1" |
| E | depth of embedment (minimum/standard) | | | 1 1/8"/2" | 1 5/8"/2 1/2" | 2 1/4"/3 1/2" | 2 3/4"/4" | 3 1/4"/4 3/4" | 4 1/2"/6" |
| HD | hole depth (E + 1 • D) min./std. | | | 1 3/8 / 2 1/4 | 2 / 2 7/8 | 2 3/4 / 4 | 3 3/8 / 4 5/8 | 4 / 5 1/2 | 5 1/2 / 7 |
| DC | wedge clearance hole in plate | | | 5/16" | 7/16" | 9/16" | 1 1/16" | 1 3/16" | 1 1/8" |
| L _A | anchor length min./max. | | | 1 3/4" 4 1/2" | 2 1/4" 7" | 2 3/4" 7" | 3 3/4" 10" | 4 1/4" 12" | 6" 12" |
| TL | thread length std./extra thread length | | | 3/4" 3" | 7/8"/1 1/8" 4" | 1 1/4" 4" | 1 1/2" 3 1/2"/4 1/2" | 1 1/2" 3 1/2"/4 1/2" | 2 1/4" 4 1/2" |
| M | Installation torque (ft. lb.) guide valves | Stainless Steel | min. E | 4 | 20 | 40 | 85 | 150 | 235 |
| | | | std. E | 7 | 30 | 75 | 110 | 200 | 450 |
| | | Carbon Steel | min. E | 4 | 20 | 40 | 85 | 150 | 250 |
| | | | std. E | 7 | 25 | 65 | 110 | 235 | 450 |
| BMT | Min. Base Material Thickness (inches) | | | 3" or 1.3 E whichever number is greater | | | | | |
| DIAMETER (in.) | | | | 1/4 | 3/8 | 1/2 | 5/8 | 3/4 | 1 |
| EMBEDMENT (in.) minimum/standard | | | | 1 1/8 2 | 1 5/8 2 1/2 | 2 1/4 3 1/2 | 2 3/4 4 | 3 1/4 4 3/4 | 4 1/2 6 |
| AS | Spacing Required to Obtain Maximum Working Load | | | 2 1/4 4 | 3 1/4 5 | 4 1/2 7 | 5 1/2 8 | 6 1/2 9 1/2 | 9 12 |
| AS _{min} | Minimum Allowable Spacing Between Anchors (in.) Refer to Note #1. | | | 1 1/8 2 | 1 5/8 2 1/2 | 2 1/4 3 1/2 | 2 3/4 4 | 3 1/4 4 3/4 | 4 1/2 6 |
| ED | Edge Distance Required To Obtain Maximum Working Load (in.) | Shear | 3 3/8 3 3/8 | 4 7/8 4 7/8 | 6 3/4 6 3/4 | 8 1/4 8 1/4 | 9 3/4 9 3/4 | 13 1/2 13 1/2 | |
| | | Tension | 1 3/4 3 | 2 1/2 3 3/4 | 3 3/8 5 1/4 | 4 1/8 6 | 4 7/8 7 1/8 | 6 3/4 9 | |
| ED _{min} | Minimum Allowable Edge Distance (in.) Refer to Note #2 & 3 | Shear | 1 3/4 1 3/4 | 2 1/2 2 1/2 | 3 3/8 3 3/8 | 4 1/8 4 1/8 | 4 7/8 4 7/8 | 6 3/4 6 3/4 | |
| | | Tension | 1 1/8 2 | 1 5/8 2 1/2 | 2 1/4 3 1/2 | 2 3/4 4 | 3 1/4 4 3/4 | 4 1/2 6 | |

NOTE: 1. When using AS_{min} reduce the working load by 30%.
2. When using ED_{min} and the load is a shear load, reduce the working load by 50%.
3. When using ED_{min} and the load is a tensile load, reduce the working load by 20%.
4. For AS and ED of anchors with actual embedments between the listed embedments, use linear interpolation.
5. For AS and ED of anchors with embedments greater than the deepest embedment listed, use value for deepest embedment listed.

HILTI, INC. - Example #3

The Hilti Drop-In Anchor

Product Details



Advantages:

Shallow embedment depth

Internal thread

Anchor is flush with base material

Internal plug

Material

Anchor material is SAE 1110M for the 1/4", 3/8" and 1/2" HDI's.

Anchor material is AISI 12L14 steel, meeting ASTM specification A 108 for 3/8" & 1/2" HDI's.

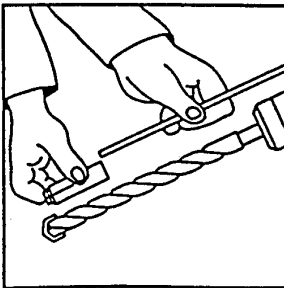
Anchor material is AISI 303 for stainless steel anchors.

Plated with dull zinc finish for corrosion protection in accordance with ASTM B633, Sc. 1, Type III.

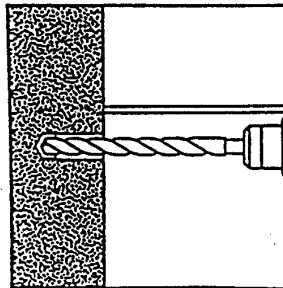
Specification Table

| Details | | Anchor Size | | | | |
|---------|------------------------------|-------------|---------|------|---------|---------|
| D | bolt size | 1/4" | 3/8" | 1/2" | 5/8" | 3/4" |
| BD | bit diameter | 3/8" | 1/2" | 5/8" | 27/32" | 1" |
| E | rec. min. depth of embedment | 1" | 1 1/16" | 2" | 2 9/16" | 3 9/16" |
| L | anchor length | | | | | |
| HD | hole depth | | | | | |

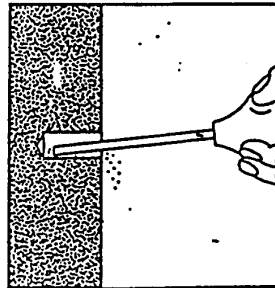
Setting Instructions



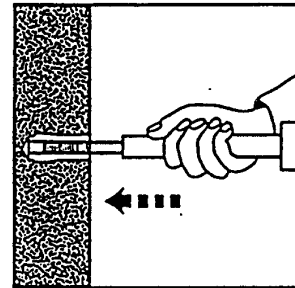
1. Adjust depth gauge



2. Hammer drill hole



3. Clean hole



4. Install anchor using proper setting tool. Setting tool to be driven into anchor until setting tool shoulder meets top of anchor.

HILTI, INC. - Example #4



4.3.1

Anchoring Systems HVA Adhesive System

4.3.1.1 PRODUCT DESCRIPTION

The Hilti HVA system is a heavy duty, two component adhesive anchor consisting of a self-contained adhesive capsule and either a threaded rod with nut and washer or an internally threaded insert.

Product Features

- High loading capacity
- Does not exert expansion pressure on base materials
- Close edge distance allowance
- Tight anchor spacing allowance
- Excellent performance in matched tolerance diamond-cored holes
- Excellent elevated temperature performance
- Excellent performance in freezing and thawing conditions
- Seismic tested per ICBO AC508, ASTM E-1512

Guide Specifications

Masterformat section: 03250 (Concrete accessories)
Related Sections: 03200 (Concrete Reinforcing—Reinforcing Accessories)
05050 (Metal Fabrication)
05120 (Structural Steel)

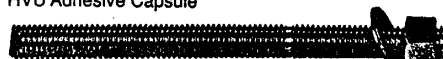
Adhesive anchors shall consist of an all-thread anchor rod, nut, washer and adhesive capsule. Alternatively, adhesive anchors shall consist of a steel insert and an adhesive capsule.

Anchor Rod—Shall be provided with 45 degree chisel point to provide proper mixing of the adhesive components. Anchor rod shall be manufactured to meet the following requirements: 1. ASTM A36 (standard carbon steel anchor) 2. ASTM A193 Grade B7 (Type 2) 3. AISI 304 or AISI 316 stainless steel meeting the mechanical requirements of ASTM F-593 (Condition CW).

Nuts and Washers—Shall be furnished to meet the requirements of the above anchor rod specifications.



HVU Adhesive Capsule



HAS Anchor Rod Assembly with nut and washer



HIS Internally Threaded Insert



Rebar (Not supplied by Hilti)

Adhesive Capsule—Shall consist of a dual chamber foil capsule. The resin material shall be vinyl urethane.

Steel Insert—The internally threaded insert shall be manufactured with a 45 degree (from central axis) chisel-pointed end. The insert shall be manufactured from carbon steel or stainless steel material which meets minimum ultimate tensile strengths of 71 and 74 ksi respectively.

The adhesive anchoring system shall be the Hilti HVA anchoring system, consisting of the Hilti HVU adhesive capsule and the Hilti HAS anchor rod or HIS internally threaded insert.

Installation—Adhesive anchors to be installed in holes drilled using the specified diameter of Hilti carbide-tipped drill bit or matched tolerance DCI core bit. Anchors shall be installed in strict accordance to section 4.3.1.4. Anchors shall not be disturbed until cure time has elapsed.

Listings/Approvals

- International Conference of Building Officials (ICBO): Evaluation Report pending
- Southern Building Code Congress International (SBCCI): Report pending
- City of Los Angeles (COLA): Research Report pending
- Metro-Date Acceptance No. pending

4.3.1.2 MATERIAL SPECIFICATIONS

| | MECHANICAL PROPERTIES | |
|---------------------------------------------------------------------------------------------------------------|-----------------------|-------------------------|
| | f_t ksi (MPa) | min. f_u ksi (MPa) |
| Standard HAS rod material meets the requirements of ASTM A36 | 36 (248) | 58 (400) |
| High Strength or 'Super HAS' rod material meets the requirements of ASTM A193, Grade B7 | 105 (724) | 125 (862) |
| Stainless HAS rod material meets the requirements of ASTM F593 (AISI 304) Condition CW 3/8" - 5/8" | 65 (448) | 100 (689) |
| Stainless HAS rod material meets the requirements of ASTM F593 (AISI 304) Condition CW 3/4" - 1 1/4" | 45 (310) | 85 (586) |
| HIS insert 9SMNPB36K Carbon Steel Conforming to DIN 1651 | 56 (390) | 71 (490) |
| HIS-R Insert X5CrNiMo17122 K700 Stainless Steel Conforming to DIN 17440 | 35 (241) | 74 (510) |
| HAS Standard Nut material meets the requirements of ASTM A563, Grade A | | |
| HAS Super Nut material meets the requirements of ASTM A563, Grade DH | | |
| HAS Stainless Steel Nut material meets the requirements of ASTM F594 | | |
| HAS Standard Washer meets dimensional requirements of ANSI B18.22.1 Type A Plain | | |
| HAS Super Washer meets the requirements of ASTM F436 | | |
| HAS Stainless Steel Washer meets dimensional requirements of ANSI B18.22.1 Type A Plain | | |
| All standard HAS & HAS Super Rods (except 7/8"), HIS inserts, nuts & washers are zinc plated to ASTM B633 SC1 | | |
| 7/8" HAS rods hot-dip galvanized in accordance with ASTM A153 | | |
| HVU Adhesive—Vinyl Urethane Resin with a Dibenzoyl Peroxide hardener | | |

Note: Special Order HAS rods, nuts and washers may vary from standard materials.

HILTI, INC. - Example #5

Anchoring Systems



HVA Adhesive System

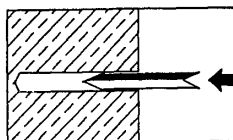
4.3.1

4.3.1.4 INSTALLATION INSTRUCTIONS—HAS ROD AND HIS INSERT



1. Set the drill depth gauge and drill a hole to the required hole depth.

IMPORTANT: Clean out dust and debris. Use compressed air or vacuum at bottom of the hole. When using a matched tolerance diamond core bit, flush hole with water from the bottom of the hole and allow concrete to dry.

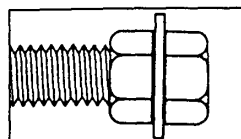


2. Insert appropriate diameter HVU adhesive capsule* into pre-drilled hole in base material.

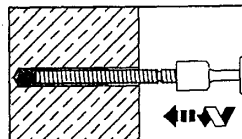
NOTE: The best method for setting multiple capsules is to crush the first capsule(s) into the hole and then insert the next capsule. **DO NOT** cut off capsules partially protruding from the hole.

*Capsule length is longer than standard embed. depth and will protrude from the hole.

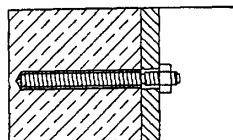
HAS Threaded Rods



3. Thread a nut on the HAS rod. Place a washer on top of the first nut and then thread a second nut down on top of the washer. Tighten the two nuts together "locking" the washer between them. The top nut should be flush with the top of the rod.

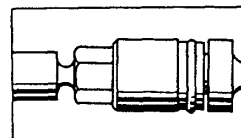


4. Insert a square drive shaft into the hammer drill and attach the proper impact socket. At the rotary hammer drill setting, engage the top nut of the HAS rod assembly with the socket and drive the rod down to the embedment mark.

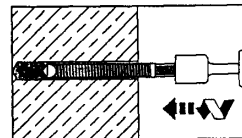


5. The set anchor rod may not be disturbed or loaded before the specified curing time elapses.

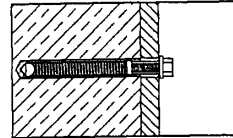
HIS Internally Threaded Insert



3. Insert the shaft with socket into the hammer drill, screw the setting tool into the HIS and place in the socket.

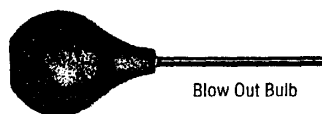


4. At the rotary hammer drill setting, drive the HIS until flush with the surface of the concrete.

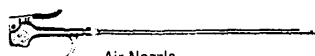


5. The set anchor can not be disturbed or loaded before the specified curing time elapses.

4.3.1.5 ORDERING INFORMATION



Blow Out Bulb



Air Nozzle

| Description | Item No. | Use |
|----------------------------------|----------|--------------------|
| Blow Out Bulb BB | 00060503 | For all hole sizes |
| Air Nozzle (Length 12") 3/8" THD | 00089314 | For all hole sizes |
| Air Nozzle (Length 24") 3/8" THD | 00063964 | For all hole sizes |

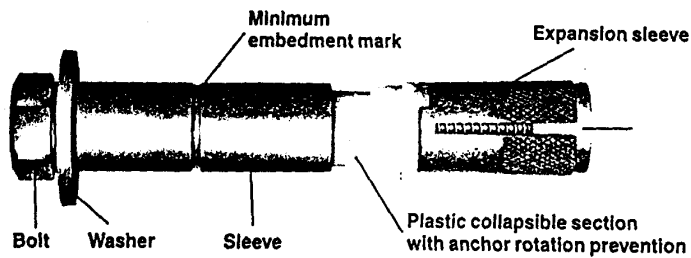
HILTI, INC. - Example #6

HSL Metric Heavy-Duty Expansion Anchor

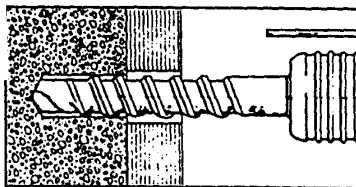
Reliable heavy-duty anchor for heavy/dynamic loads

Product Details

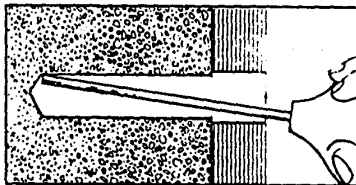
Hilti HSL Heavy-Duty Anchor



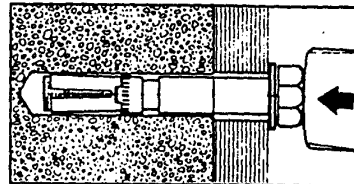
HSL Metric Installation Instructions



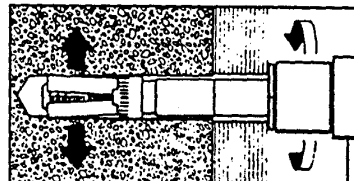
1. Drill a hole with the prescribed Hilti metric bit. Note: the HSL can be installed in a bottomless hole.



2. Clean the hole using a blow-out bulb or compressed air.



3. Using a hammer, tap the preassembled anchor through the object being anchored into the hole. The anchor should be seated firmly against the base plate. Note: do not expand the anchor by hand before tapping it into the hole.

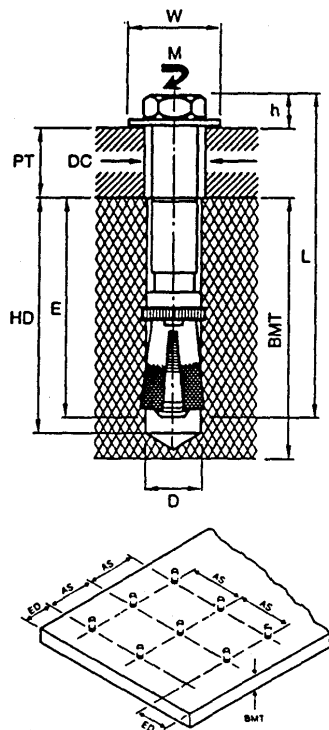


4. Tighten bolt or nut to the specified torque, using a torque wrench.

Note: When using an HSLB anchor no torque wrench is required. The torque cap shears off at the specified torque value.

HILTI, INC. - Example #7

HSL Metric Specification Table



Notes:

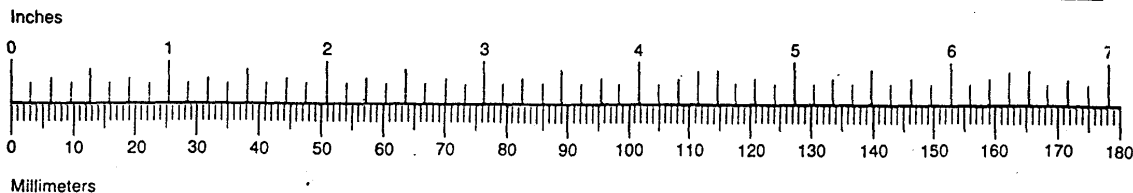
1. When using AS_{min} reduce the working load by 30%
2. When using ED_{min} and the load is a shear load, reduce the working load by 70%
3. When using ED_{min} and the load is a tensile load, reduce the working load by 30%
4. To convert mm's to inches divide by 25.4

| Thread size | | M8/20 | M8/40 | M10/20 | M10/40 | M12/25 | M12/50 | M16/25 | M16/50 | M20/30 | M20/60 | M24/30 | M24/60 |
|------------------|-------------------------------------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------------|---------------------------|---------------------|---------------------|--------|--------|--------|--------|--------|--------|
| Setting details | | | | | | | | | | | | | |
| D (mm) | drill bit dia. | 12 | 15 | 18 | 24 | 28 | 32 | | | | | | |
| HD (mm) | hole depth | 75 | 85 | 100 | 125 | 150 | 175 | | | | | | |
| E (mm) | min. depth of embedment | 65 | 75 | 80 | 105 | 130 | 155 | | | | | | |
| AS | spacing required to obtain maximum working load (mm) | 195 | 225 | 240 | 315 | 390 | 465 | | | | | | |
| AS min | Minimum allowable spacing between anchors (mm) Refer to note 1 | 65 | 75 | 80 | 105 | 130 | 155 | | | | | | |
| ED | Edge distance required to obtain maximum working load (mm) | 162 | 187 | 200 | 262 | 325 | 387 | | | | | | |
| ED min | Minimum allowable edge distance (mm) Refer to notes 2 and 3 | 65 | 75 | 80 | 105 | 130 | 155 | | | | | | |
| PT (mm) | max. thickness fastened | 20 | 40 | 20 | 40 | 25 | 50 | 25 | 50 | 30 | 60 | 30 | 60 |
| L (mm) | anchor length | 95 | 115 | 107 | 127 | 120 | 145 | 148 | 173 | 183 | 213 | 205 | 235 |
| h (mm) | head height + washer | 7.5 | 10 | 11 | 14 | 17 | 19 | | | | | | |
| M (ft.-lbs.) | max. tightening torque | 20 | 40 | 60 | 150 | 300 | 525 | | | | | | |
| Max. gap (mm) | | 4 | 5 | 8 | 9 | 12 | 16 | | | | | | |
| Wrench Size (mm) | HSL/HSLG | 13 | 17 | 19 | 24 | 30 | 36 | | | | | | |
| | HSLB | — | — | 24 | 30 | 36 | 41 | | | | | | |
| DC (mm) | clearance hole | 14-15 | 17-18 | 20-21 | 26-28 | 31-33 | 35-37 | | | | | | |
| W (mm) | washer dia. | 20 | 25 | 30 | 40 | 45 | 50 | | | | | | |
| BMT (mm) | min. base material thickness | 120 | 140 | 160 | 180 | 220 | 270 | | | | | | |
| Drill bit | | TE-C12/20 TE-F-12/34 | TE-C-15/25 TE-F-15/34 | TE-C-18/20 TE-F-18/34 | TE-C-24/25 TE-F-24/32 | TE-F-28/37 | TE-F-32/37 | | | | | | |
| Hammer Drill | | TE10, TE12S, TE22, TE52, TE72 | TE10, TE12S, TE22, TE52, TE72 | TE10, TE12S, TE22, TE52, TE72, TE92 | TE22, TE52, TE72, TE92 | TE52, TE72, TE92 | TE52, TE72, TE92 | | | | | | |

The HSL Metric Anchor Spacing and Edge Distances are Calculated Using the Following Information:

| | Anchor Spacing | | | Edge Distance Shear Load Only | | | Edge Distance Tension Load Only | | |
|-----|----------------|-------------------|-----------------|----------------------------------|---------------------|-----------------|------------------------------------|-------------------|-----------------|
| | AS | AS _{min} | f _{AS} | ED | ED _{min} | f _{ED} | ED | ED _{min} | f _{ED} |
| HSL | 3.0E | 1.0E | 0.7 | 2.5E _{min} | 1.0E _{min} | 0.3 | 2.5E | 1.0E | 0.7 |

Metric Ruler



ITW RAMSET/RED HEAD ANCHORS - Example #1



MADE
IN
U.S.A.

ITW Ramset/Red Head



TRUBOLT WEDGE

**DEPENDABLE, HEAVY DUTY, INSPECTABLE,
WEDGE TYPE EXPANSION ANCHOR**

- Versatile fully threaded design is standard on sizes up to $\frac{3}{4}$ " diameter and 7" length.
- Anchor diameter equals hole diameter.
- One piece stainless steel expander clip resists corrosion.
- 360° contact with concrete assures full expansion for reliable working loads.
- Non bottom-bearing, may be used in hole depth exceeding anchor length.
- Supplied complete with nut and washer.
- Can be installed through the work fixture, eliminating hole spotting.
- Inspectable torque values, indicating proper installation.
- Heavy duty pull-out and shear capacities.

MODELS/VARIATIONS

Zinc-plated Carbon Steel—standard anchor for all structural and in-plant uses. Zinc-plated in accordance with Federal specification QQ-Z-325C Type II, Class 3.

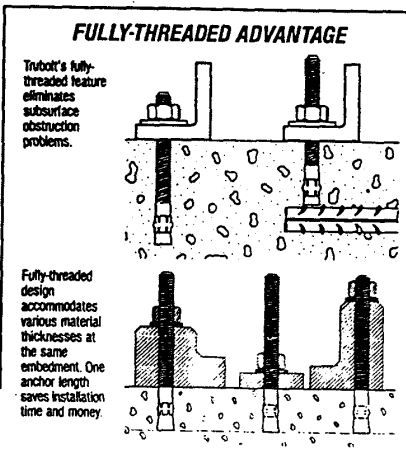
Galvanized Steel—provides protection from mildly humid, corrosive or brine atmospheres. Outdoor applications include fencing, gates, handrails, docks, conveyors, highway guard rails, signs, lighting and safety devices. Galvanized in accordance with ASTM A153 Class C. (Nuts and washers are also hot dipped galvanized.)

Stainless Steel—for protection in humid, highly corrosive and acidic environments. Used extensively in architecture to mount aluminum and stainless steel window frames and curtain walls. Bolt body 302HQ, 303, or 316 stainless steel. Type 302HQ stainless steel exhibits the same corrosion resistance as Type 304 stainless. It meets ASTM A276 and A479 specifications.

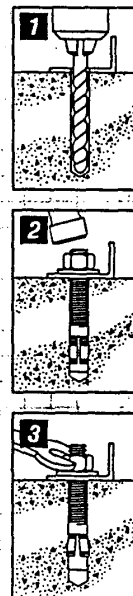
APPROVALS/LISTINGS

Meets or exceeds U.S. Government G.S.A.
Specification FF-S-325 Group II, Type 4, Class I.

- Underwriters Laboratories.
- Factory Mutual.
- ICBO Evaluation Service, Inc. Report #1372.
- City of Los Angeles, Report #RR2748.
- Metro Dade County Florida.
- SBCCI Compliance Report #9053.
- California State Fire Marshal.



INSTALLATION STEPS



1. Using a bit whose diameter equals the anchor diameter, drill hole to any depth exceeding minimum embedment. Clean hole.
2. Assemble anchor with nut and washer so that the top of the nut is flush with the top of the anchor. Drive anchor through material to be fastened so that nut and washer is flush with surface of material.
3. Expand anchor by tightening nut 3 to 5 turns, or to the specified torque requirement. (see selection chart)

See Installation Cautions on Back Page.

ITW RAMSET/RED HEAD ANCHORS - Example #2

| Carbon Steel | | Galvanized Steel | | 302HQ/303** Stainless Steel | | 316 Stainless Steel | | Anchor Diameter & Drill Bit Size/Threads Per Inch | A Overall Length | B Max. Thickness of Material to be Fastened | D Min. Embedment in Concrete | Installation Torque (Ft. Lbs.) |
|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|------------------------------------------------------|----------------------------------|---------------------------------------------------------------|------------------------------------------------|--------------------------------------------------|------------------------------------------|---------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------------|------------------------------|--------------------------------|
| Catalog Number | C Thread Length | Catalog Number | C Thread Length | Catalog Number | C Thread Length | Catalog Number | C Thread Length | | | | | |
| WS-1416* WS-1422* WS-1432* | 3/4" 1-1/4" 2-1/4" | | | WW-1416* WW-1422* WW-1432* | 3/4" 1-1/4" 2-1/4" | SWW-1416 SWW-1422 | 3/4" 3/4" | 1/4"/20 | 1-3/4" 2-1/4" 3-1/4" | 3/8" 7/8" 1-7/8" | 1-1/8" | 8 |
| ♦WS-3822* ♦WS-3826* ♦WS-3830* ♦WS-3836* ♦WS-3850* | 1-1/8" 1-5/8" 1-7/8" 2-5/8" 2-1/2" | | | ♦WW-3822* ♦WW-3826* ♦WW-3830* ♦WW-3836* ♦WW-3850* | 1-1/8" 1-5/8" 1-7/8" 2-5/8" 2-1/2" | ♦SWW-3826 ♦SWW-3830 ♦SWW-3836 | 1-1/8" 1-1/8" 1-1/8" | 3/8"/16 | 2-1/4" 2-3/4" 3" 3-3/4" 5" | 3/8" 7/8" 1-1/8" 1-7/8" 3-1/8" | 1-1/2" | 25 |
| ♦WS-1226* ♦WS-1236* ♦WS-1242* ♦WS-1254* ♦WS-1270* | 1-1/4" 2-1/4" 2-3/4" 3" 4-1/2" | ♦WS-1226G* ♦WS-1242G* ♦WS-1254G* ♦WS-1270G* | 1-1/4" 2-3/4" 3" 4-1/2" | ♦WW-1226* ♦WW-1236* ♦WW-1242* ♦WW-1254* ♦WW-1270* | 1-1/4" 2-1/4" 2-3/4" 3" 4-1/2" | ♦SWW-1226 ♦SWW-1236 ♦SWW-1242 ♦SWW-1254 | 1-5/16" 1-5/16" 1-5/16" 1-5/16" | 1/2"/13 | 2-3/4" 3-3/4" 4-1/4" 5-1/2" 7" | 1/8" 3/4" 1-1/2" 2-3/4" 4-1/4" | 2-1/4" | 55 |
| ♦WS-5834* ♦WS-5842* ♦WS-5850* ♦WS-5860* ♦WS-5870* ♦WS-5884* ♦WS-58100 | 1-3/4" 2-1/2" 3-1/4" 3-1/2" 4-1/2" 1-3/4" 1-3/4" | ♦WS-5834G* ♦WS-5860G* | 1-3/4" 3-1/2" | ♦WW-5834* ♦WW-5850* ♦WW-5860* ♦WW-5870* ♦WW-5884 | 1-3/4" 3-1/4" 3-1/2" 4-1/2" 1-3/4" | ♦SWW-5850 ♦SWW-5884 | 1-3/4" 1-3/4" | 5/8"/11 | 3-1/2" 4-1/4" 5" 6" 7" 8-1/2" 10" | 1/8" 7/8" 1-5/8" 2-5/8" 3-5/8" 5-1/8" 6-5/8" | 2-3/4" | 90 |
| ♦WS-3442* ♦WS-3446* ♦WS-3454* ♦WS-3462* ♦WS-3470* ♦WS-3484* ♦WS-34100 ♦WS-34120 | 1-3/4" 2-1/4" 3" 3-3/4" 4-1/2" 1-3/4" 1-3/4" 1-3/4" | ♦WS-3446G* ♦WS-3454G* | 2-1/4" 3" | ♦WW-3446* ♦WW-3454* ♦WW-3470* ♦WW-3484 ♦WW-34100 | 2-1/4" 3" 4-1/2" 1-3/4" 1-3/4" | ♦SWW-3446 ♦SWW-3454 | 1-3/4" 1-3/4" | 3/4"/10 | 4-1/4" 4-3/4" 5-1/2" 6-1/4" 7" 8-1/2" 10" 12" | 1/4" 3/4" 1-1/2" 2-1/4" 3" 4-1/2" 6" 8" | 3-1/4" | 175 |
| WS-7860 WS-7880 WS-78100 | 2-1/2" 2-1/2" 2-1/2" | | | WW-7880 | 2-1/2" | | | 7/8"/9 | 6" 8" 10" | 1-3/8" 3-3/8" 5-3/8" | 3-3/4" | 250 |
| †WS-10060 †WS-10090 †WS-100120 | 2-1/2" 2-1/2" 2-1/2" | †WS-10090G | 2-1/2" | WW-10060 WW-10090 | 2-1/2" 2-1/2" | | | 1"/8 | 6" 9" 12" | 1/2" 3-1/2" 6-1/2" | 4-1/2" | 300 |
| †WS-12590 †WS-125120 | 3-1/2" 3-1/2" | | | | | | | 1-1/4"/7 | 9" 12" | 2-1/4" 5-1/4" | 5-1/2" | 500 |
| Tie Wire TWS-1400 | N/A | | | | | | | 1/4" | 2-3/16" | Eye Dia. 9/32" | 1-1/8" | N/A |

*Fully Threaded

1 Performance data also available for concrete strengths from 2500 to 5500 PSI, and lightweight aggregate concrete from 4000 to 6000 PSI.

†Carbon steel anchor sizes through 7/8" in diameter have stainless steel expansion clips. Larger diameter carbon steel and galvanized anchors have carbon steel expansion clips. All size stainless steel anchors have stainless steel expansion clips. †Denotes carbon steel clip.

2 Ultimate load capacity in 4,000 PSI stone aggregate concrete. Ultimate pullout and shear loads are indicated for the depth of embedment in concrete shown in the "Embedment in Concrete" column. Based on independent Testing Laboratory tests.

1-1/4" diameter carbon steel anchors were tested at a depth of 10-1/2" for tensile capacities, and 10" for shear. 1" diameter stainless steel anchors were tested at a depth of 10-1/2" for tensile capacities, and 10-1/4" for shear. Safe working loads for single installations under static loading should not exceed 25% of the ultimate load capacity. For information on other conditions, contact your nearest factory representative.

For load capacities in structural lightweight aggregate concrete, refer to ICBO Report #1372 or contact Technical Service Department.

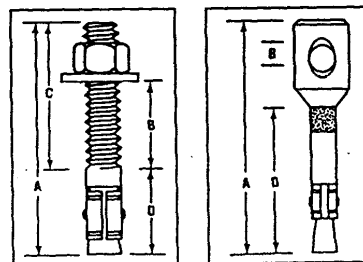
For extreme low temperature applications, use stainless steel anchors.

NOTE: Capacities shown in Selection Chart are based on most recent testing performed in compliance with ASTM E-488 and ICBO Research Committee Standards for Testing Expansion Anchors in Concrete.

♦Indicates Approval.

• Indicates Listing.

**"WW" anchor body material may be Type 303 or Type 302HQ according to metal forming efficiency. Type 302HQ meets corrosion resistant properties of Type 303 and 304.



ITW RAMSET/RED HEAD ANCHORS - Example #3



MADE
IN
U.S.A.

ITW Ramset/Red Head



DYNABOLT SLEEVE

VERSATILE, HEAVY-DUTY SLEEVE ANCHOR

- Anchor diameter equals hole diameter.
- Available in hex head and 6 other head styles.
- Provides full 360° hole contact over large area and reduces concrete stress.
- Heavy-loading capacity.
- Preassembled for faster, easier installations.
- Dynabolt can be installed through object to be fastened.
- Six rib sleeve design improves holding power.
- No pre-spotting of holes necessary.

MODELS/VARIATIONS

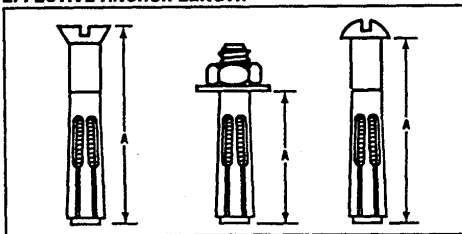
Carbon Steel—Sleeve anchors are available in sizes from ¼" to ¾", and in lengths from 1½" to 6¼". Head styles available are acorn nut, hex nut, flat head, threshold flat head, round head, tie wire and hex coupling. Zinc plated in accordance with Fed. Spec. QQ-Z-325C Type II, Class 3.

Stainless Steel—for protection in humid or corrosive environments, stainless hex head, flat head and round head sleeve anchors are available.

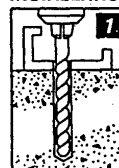
SELECTION CHART

| Head Style | Carbon Steel | Stainless Steel | Anchor Diameter & Drill Bit Size | A Effective Anchor Length | Bolt Diameter/Threads Per Inch | Min. Embedment | Max. Thickness Of Material To Be Fastened | 4000 PSI ¹ | 4000 PSI ¹ |
|------------|----------------|-----------------|----------------------------------|---------------------------|--------------------------------|----------------|-------------------------------------------|------------------------------------|----------------------------------|
| | Catalog Number | Catalog Number | | | | | | Ultimate Pullout ¹ Lbs. | Ultimate Shear ¹ Lbs. |
| | HN-1405 | | 1/4" | 5/8" | 3/16"/24 | 1/2" | 1/8" | 500 | 1751 |
| | HN-1413 | | 1/4" | 1-3/8" | 3/16"/24 | 1-1/8" | 1/4" | 1613 | 1751 |
| | HN-1422 | | 1/4" | 2-1/4" | 3/16"/24 | 1-1/8" | 1-1/8" | 1613 | 1751 |
| | HN-1614 | | 5/16" | 1-1/2" | 1/4"/20 | 1-1/4" | 1/4" | 2429 | 2487 |
| | HN-1624 | | 5/16" | 2-1/2" | 1/4"/20 | 1-1/4" | 1-1/4" | 2429 | 2487 |
| | HN-3817 | SHN-3817 | 3/8" | 1-7/8" | 5/16"/18 | 1-1/2" | 3/8" | 2597 | 2872 |
| | HN-3830 | SHN-3830 | 3/8" | 3" | 5/16"/18 | 1-1/2" | 1-1/2" | 2597 | 2872 |
| | ◆HN-1222 | ◆SHN-1222 | 1/2" | 2-1/4" | 3/8"/16 | 1-7/8" | 3/8" | 5385 | 5582 |
| | ◆HN-1230 | | 1/2" | 3" | 3/8"/16 | 1-7/8" | 1-1/8" | 5385 | 5582 |
| | ◆HN-1240 | ◆SHN-1240 | 1/2" | 4" | 3/8"/16 | 1-7/8" | 2-1/8" | 5385 | 5582 |
| | ◆HN-5822 | | 5/8" | 2-1/4" | 1/2"/13 | 2" | 1/4" | 5708 | 7435 |
| | ◆HN-5830 | | 5/8" | 3" | 1/2"/13 | 2" | 1" | 5708 | 7435 |
| | ◆HN-5842 | ◆SHN-5842 | 5/8" | 4-1/4" | 1/2"/13 | 2" | 2-1/4" | 5708 | 7435 |
| | ◆HN-5860 | | 5/8" | 6" | 1/2"/13 | 2" | 4" | 5708 | 7435 |
| | ◆HN-3424 | | 3/4" | 2-1/2" | 5/8"/11 | 2-1/4" | 1/4" | 6470 | 13071 |
| | ◆HN-3440 | | 3/4" | 4" | 5/8"/11 | 2-1/4" | 1-3/4" | 6470 | 13071 |
| | ◆HN-3462 | | 3/4" | 6-1/4" | 5/8"/11 | 2-1/4" | 4" | 6470 | 13071 |

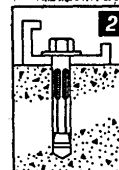
EFFECTIVE ANCHOR LENGTH



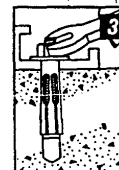
INSTALLATION STEPS



1. Use a bit whose diameter is equal to the anchor. See Selection Chart to determine proper size bit for anchor used. Drill hole to any depth exceeding minimum embedment. Clean hole.



2. Insert assembled anchor into hole, so that washer or head is flush with materials to be fastened.



3. Expand anchor by tightening nut or head 2 to 3 turns.

See Installation Cautions on Back Page.

ITW RAMSET/RED HEAD ANCHORS - Example #4

ITW Ramset/Red Head



MADE
IN
U.S.A.

MULTI-SET II DROP-IN

INTERNALLY THREADED, HEAVY-DUTY, STEEL EXPANSION DROP-IN ANCHOR

- Flange-topped, non-bottom bearing anchor.
- Fast, easy installation.
- Multi-Set II anchor can be installed flush or recessed in a hole of any depth.
- Four-way slot assures dependable, uniform anchor expansion.
- Pre-assembled plug cannot fall out in shipment, or during installation.

- Anchor body installs quickly and reduces concrete unit stress.
- Layout and hole-spotting necessary for accurate installation.

MODELS/VARIATIONS

Carbon Steel—Multi-Set II Anchors are available in sizes ¼" through ¾". Zinc plated in accordance with Fed. Spec. QQ-Z-325C Type II, Class 3.

Stainless Steel—for protection in humid or corrosive environments, available in sizes ¼" through ¾".

SELECTION CHART

| Carbon Steel Cat. No. | 303 Stainless Steel Cat. No. | Bolt Size/Threads Per Inch | Drill Bit Size | A Thread Depth | B Min. Hole Depth | Ultimate Pullout* Lbs. | Ultimate Shear* Lbs. | Setting Tool Cat. No. 2 |
|-----------------------|------------------------------|----------------------------|----------------|----------------|-------------------|------------------------|----------------------|-------------------------|
| RM-14 | SRM-14 | 1/4"/20 | 3/8" | 3/8" | 1" | 3,204 | 1,986 | RT-114 |
| ♦RM-38 | ♦SRM-38 | 3/8"/16 | 1/2" | 1/2" | 1-5/8" | 6,350 | 3,968 | RT-138 |
| ♦RM-12 | ♦SRM-12 | 1/2"/13 | 5/8" | 3/4" | 2" | 8,544 | 6,502 | RT-112 |
| ♦RM-58 | ♦SRM-58 | 5/8"/11 | 7/8" | 1" | 2-1/2" | 15,218 | 10,380 | RT-158 |
| ♦RM-34 | | 3/4"/10 | 1" | 1-1/4" | 3-3/16" | 17,255 | 13,962 | RT-134 |

*Performance data also available for lightweight aggregate concrete from 4000 to 6000 PSI.
†Use only Ramset/Red Head setting tools to insure proper installation.
‡Ultimate load capacity in 4310 PSI 3/4 inch crushed limestone aggregate concrete. Capacities are for carbon steel versions. Based on Independent Testing Laboratory tests. Copies of reports are available on request.

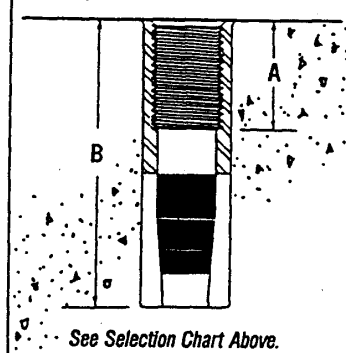
For load capacities in structural lightweight aggregate concrete refer to ICBO Report No. 1372 or contact Technical Service Dept.

Safe working loads for single installations under static loading should not exceed 25% of the ultimate load capacity. For information on other conditions, contact your nearest factory representative.

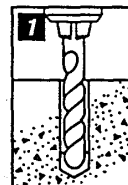
♦ Indicates Approval. • Indicates UL Listing.

For additional Approvals/UL Listings see Selector Guide (page 2).

INTERNALLY THREADED, HEAVY DUTY, STEEL EXPANSION DROP-IN ANCHOR

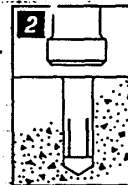


INSTALLATION STEPS



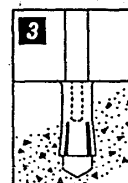
To set anchor flush with surface.

1. Drill hole the same diameter as anchor being used to any depth exceeding minimum embedment. Clean hole.



2. Drive anchor flush with surface of concrete.

3. Expand anchor with setting tool provided. Anchor is properly expanded when shoulder of setting tool is flush with top of anchor.



To set anchor below surface.

- 1a. Drill hole deeper than anchor length. Thread bolt into anchor. Hammer anchor into hole until bolt head is at desired depth. Remove bolt and set anchor with setting tool.

See Installation Cautions on Back Page.

ITW RAMSET/RED HEAD ANCHORS - Example #5



ITW Ramset/Red Head

SELF-DRILL

MADE
IN
U.S.A.



HEAVY-DUTY ANCHOR THAT DRILLS ITS OWN HOLE

- Anchor expands by driving anchor over the plug.
- Hole diameter and depth are assured.
- Dependable, powerful holding capacity.
- Self-drilling action produces accurate hole size, every time.
- Fast, easy installation.
- Eliminates use of carbide bits by drilling its own hole.
- Perfect for dependable overhead applications.

MODELS

Self-drilling anchors are available in snap-off design, sizes 1/4" through 3/4" for floor, wall and ceiling installation with rotary/stop hammer. Zinc plated in accordance with Fed. Spec. QQ-Z-325C Type II, Class 3. Meets or exceeds U.S. Government G.S.A. Specification FF-S-325 Group III, Type 1.

VARIATIONS

Self-drilling anchors are available with oversize internal threads to accept galvanized bolts. (Special order.)

SELECTION CHART

| Cat. No. | Bolt Size/Threads Per Inch | A Thread Depth | B Depth in Concrete | Outside Dia. | Ultimate ¹ Pullout * Lbs. | Ultimate ¹ Shear * Lbs. |
|----------|----------------------------|----------------|---------------------|--------------|--------------------------------------|------------------------------------|
| S-14 | 1/4"/20 | 3/8" | 1-3/32" | 7/16" | 2,713 | 2,103 |
| •S-38 | 3/8"/16 | 9/16" | 1-17/32" | 9/16" | 4,200 | 4,550 |
| •S-12 | 1/2"/13 | 13/16" | 2-1/32" | 11/16" | 7,350 | 6,800 |
| •S-58 | 5/8"/11 | 15/16" | 2-15/32" | 27/32" | 10,250 | 9,900 |
| •S-34 | 3/4"/10 | 1-7/32" | 3-1/4" | 1" | 13,950 | 12,350 |

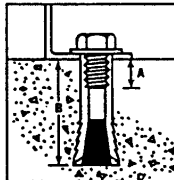
¹Performance data also available for concrete strengths from 2000 to 4000 PSI and lightweight aggregate concrete from 4000 to 6000 PSI.
*Ultimate load capacity in 4713 PSI 3/4 inch crushed limestone aggregate concrete. Based on Independent Testing Laboratory tests.

For load capacities in structural lightweight aggregate concrete refer to ICBO Report No. 1372 or contact Technical Service Dept.

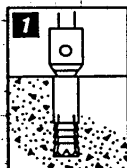
Safe working loads for single installations under static loading should not exceed 25% of the ultimate load capacity. For information on other conditions, contact your nearest factory representative.

• Indicates Approval. • Indicates Listing.

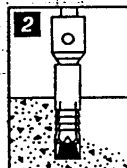
For additional Approvals/Listings see Selector Guide (page 2).



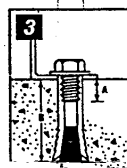
INSTALLATION STEPS



1. Using the anchor as the drill bit, drill hole until chuck holder is flush with surface of concrete. Remove anchor from hole and clean out anchor and hole.



2. Insert red plug in anchor. Expand anchor by reinserting it into hole and driving it in until chuck holder is flush with the surface of the concrete. Snap off cone.



3. Bolt the object to complete the installation.

See Installation Guidelines on back page.

CHUCK SHANKS (with Drift Pins)

| Catalog Number | Chuck Used | Shank Type |
|----------------|---------------|------------|
| SS-47 | RH Chuck Head | Spline |

SELF-DRILL CHUCK HEADS

| Catalog Number | Shank Used Spline | Anchor Size |
|----------------|-------------------|-------------|
| RH-514 | SS-47 | 1/4" |
| RH-538 | SS-47 | 3/8" |
| RH-512 | SS-47 | 1/2" |
| RH-558 | SS-47 | 5/8" |
| RH-534 | SS-47 | 3/4" |

ITW RAMSET/RED HEAD ANCHORS - Example #6



MADE
IN
U.S.A.

ITW Ramset/Red Head

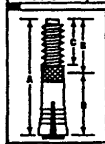


STUD ANCHOR

BOTTOM BEARING, EXTERNAL THREAD EXPANSION ANCHOR

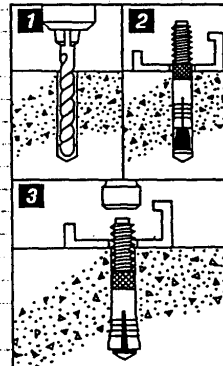
- Fast and easy to install.
- Drill bit size equals anchor diameter.
- Hammer-driven for dependable load capacity.
- Anchor can be installed through object to be fastened, no hole spotting is necessary.
- Each Stud Anchor is pre-assembled.
- Bottom-bearing design is ideal for jacking and leveling.

| Catalog Number | Hole & Drill Bit Size/Threads Per Inch | A Overall Length | B Stud Length | C Thread Length | D Min. Embedment | Ultimate ¹ Pullout* Lbs. | Ultimate ¹ Shear** Lbs. |
|-------------------------------|----------------------------------------|----------------------------|----------------------------|----------------------------|------------------|-------------------------------------|------------------------------------|
| JS-14C JS-14H JS-14M | 1/4"/20 | 1-3/4" 2-1/4" 3-1/4" | 3/4" 1-1/8" 2-1/8" | 5/8" 7/8" 7/8" | 1-3/8" | 1,909 | 2,186 |
| ♦JS-38C ♦JS-38H ♦JS-38M | 3/8"/16 | 2-1/4" 3" 3-3/4" | 1" 1-5/8" 2-1/4" | 3/4" 1-1/4" 1-1/4" | 1-5/8" | 2,327 | 4,575 |
| ♦JS-12C ♦JS-12H ♦JS-12M | 1/2"/13 | 2-3/4" 4-1/4" 5-1/4" | 1-1/8" 2-1/2" 3-5/8" | 7/8" 2" 2" | 1-7/8" | 5,826 | 6,524 |
| ♦JS-58C ♦JS-58H ♦JS-58M | 5/8"/11 | 3-3/8" 5" 7" | 1-3/8" 3" 5" | 1" 2-1/4" 2-1/4" | 2-3/8" | 7,705 | 11,199 |
| ♦JS-34C ♦JS-34H ♦JS-34M | 3/4"/10 | 4-1/4" 6-1/4" 8-1/2" | 1-3/4" 3-3/4" 6" | 1-3/8" 2-1/2" 2-1/2" | 2-7/8" | 9,597 | 15,276 |



¹Performance data also available for concrete strengths from 2000 to 4000 PSI, and lightweight aggregate concrete from 4000 to 6000 PSI.
²Ultimate load capacity in 4090 PSI 3/4 inch crushed limestone aggregate concrete. Based on independent testing laboratory tests. For load capacities in structural lightweight aggregate concrete refer to ICBO Report No. 1372 or contact Technical Service Dept. Safe working loads for single installations under static loading should not exceed 25% of the ultimate load capacity. For information on other conditions, contact your nearest factory representative.
 ♦Indicates Approval. • Indicates Listing.
 For additional Approvals/ Listings see Selector Guide (page 2).

INSTALLATION STEPS



1. Drill hole same diameter as anchor to embedment specified in chart. Clean hole.
2. Drive anchor with red plug in bottom, through material to be fastened.
3. Expand anchor by driving anchor over plug with hammer.

See Installation Cautions on Back Page.

Non-DRILL

MADE
IN
U.S.A.

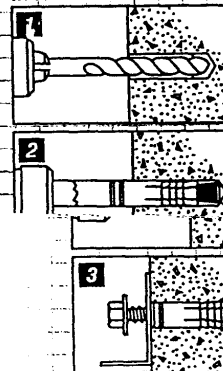
HEAVY-DUTY, INTERNAL THREAD EXPANSION ANCHOR

- Anchor expands by driving the anchor over the plug.
- Vibration and shock resistant.
- Perfect for flush installations.
- Bottom-bearing design for immediate loading.
- Anchor is hammer-driven.

| Cat. No. | Bolt Size/Threads Per Inch | Anchor Diameter (Drill Size) | Thread Depth | Min. Hole Depth | Ultimate ¹ Pullout* (Lbs.) | Ultimate ¹ Shear** (Lbs.) | Setting Tool Cat. No. |
|----------|----------------------------|------------------------------|--------------|-----------------|---------------------------------------|--------------------------------------|-----------------------|
| J-14 | 1/4"/20 | 7/16" | 3/6" | 1-7/8" | 3,850 | 10,14 | JD-38 |
| ♦J-38 | 3/8"/16 | 9/16" | 15/32" | 1-9/16" | 3,978 | 7,373 | JD-12 |
| ♦J-12 | 1/2"/13 | 11/16" | 23/32" | 2-1/16" | 7,549 | 8,863 | JD-58 |
| ♦J-58 | 5/8"/11 | 27/32" | 7/8" | 2-9/16" | 10,847 | 13,618 | JD-34 |
| ♦J-34 | 3/4"/10 | 1" | 1-1/8" | 3-3/16" | 12,260 | 16,282 | |

¹Performance data also available for concrete strengths from 2000 to 4000 PSI.
²Ultimate load capacity in 4090 PSI 3/4 inch crushed limestone aggregate concrete. Based on independent testing laboratory tests. For load capacities in structural lightweight aggregate concrete refer to ICBO Report No. 1372 or contact Technical Service Dept. Safe working loads for single installations under static loading should not exceed 25% of the ultimate load capacity. For information on other conditions, contact your nearest factory representative.
 **Shear tests were conducted in 3802 PSI concrete.
 ♦Indicates Approval. • Indicates Listing.

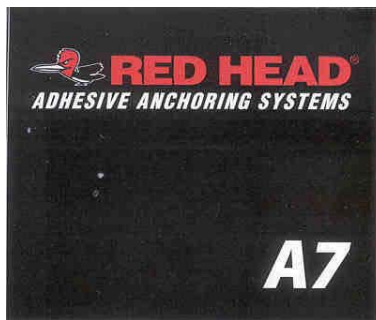
INSTALLATION STEPS



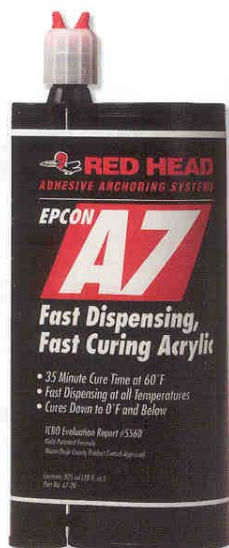
1. Drill hole to anchor diameter and embedment specified in the chart. Clean hole.
2. Place red plug snug in anchor. Drop in hole and expand anchor with a few blows of hammer on setting tool until flush or slightly below flush with the concrete surface.
3. Insert bolt and secure item being installed.

See Installation Cautions on Back Page.

ITW RAMSET/RED HEAD ANCHORS – Example #7



**Easy to Use—
A7 Saves You
Time and Money**



A7-28



A102

22

RED HEAD®

DESCRIPTION/SUGGESTED SPECIFICATIONS*

*Suggested Specifications see pages 24-25

Fast Dispensing, Fast Curing Acrylic Adhesive

The acrylic resin and hardening agent are completely mixed as they are simultaneously dispensed from the dual cartridge through a static mixing nozzle, directly into the anchor hole. A7 can be used with threaded rod or rebar (for fastening to hollow base materials, see page 46 and 49).



**How Can
An Adhesive
Anchor Save
You Money?**

- Incredibly fast dispensing and rod installation times
- Significantly faster curing times
- Easy to use (no-heating) even at freezing cold temperatures
- Requires less adhesive

ADVANTAGES

- All weather formula, down to 0°F and below
- No drip, no sag, easy clean up
- Fast & easy dispensing, even 28 ounce cartridge can be hand dispensed
- Fast curing time, 35 minutes at 60°F
- Not mix ratio sensitive
- Rods are easier to insert into the hole with A7 compared with other adhesives
- Works in damp holes and underwater applications
- Requires less adhesive—can be used in 1/16" oversized or 1/8" oversized holes
- One formula for both hollow and solid base materials

Curing Times and Dispensing Speeds

| TEMPERATURE (°F/°C) | WORKING TIME | FULL CURE TIME |
|------------------------|-----------------|-------------------|
| 100° / 38° | 5 minutes | 25 minutes |
| 80° / 27° | 5.5 minutes | 30 minutes |
| 60° / 16° | 7 minutes | 35 minutes |
| 40° / 4° | 15 minutes | 75 minutes |
| 20° / -7° | 35 minutes | 6 hours |
| 0° / -18° | 4 hours | 24 hours |

¹ Dispensing rates for A7-28 cartridge using A200 pneumatic tool.
Cartridge temperature = temperature shown

ITW Ramset/Red Head

Call our toll free number 800-899-7890 or visit our web site for the most current product and technical information at www.ramset-redhead.com

ITW RAMSET/RED HEAD ANCHORS – Example #7, page2

A7

APPLICATIONS



Stadium Seating

The fast dispensing, fast curing properties of A7 made it ideal for installing over 70,000 seats in this NFL football stadium and many others.



Roadway Doweling

A7 dispenses so quickly and rebar inserts so easily that contractors find installed costs are lower than many other products including grout for doweling.



Scaffolding Attachment

Fast curing adhesive in 28 ounce cartridges kept this project moving upwards without delays.

FEATURES



ANCHORAGE TO SOLID CONCRETE

Threaded Rod (Carbon or Stainless Steel) or Rebar supplied by contractor; rod does not need to be chisel pointed

A7 adhesive completely fills area between rod and hole creating a stress free, high load anchorage

Pre-drilled hole in concrete; see performance tables for suggested hole sizes

APPROVALS/LISTINGS

ASTM Type IV, Grade 3, Class A, B, C (exceptions - A7 gels faster than ASTM requirements and does not contain any epoxy)

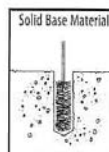
ICBO Evaluation Service, Inc. – #ER-5560

Metro-Dade County – #01-0501.01

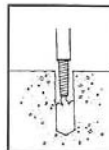
City of Los Angeles – RR#25379

DOT Approvals (see page T1)

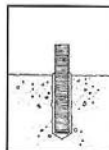
INSTALLATION STEPS



1. Drill proper sized hole. Clean out hole from bottom with forced air. Complete hole preparation with use of a brush and repeat cleaning with forced air (leave no dust or slurry).



2. When starting new cartridge or nozzle, dispense and discard enough adhesive until uniform dark grey color is achieved. Insert the nozzle into the bottom of the hole and fill to 1/2 the hole depth.



3. Insert the selected rod slowly by hand into the bottom of the hole with a slow twisting motion. This insures the adhesive fills voids and crevices uniformly.



4. See A7 Cure Time Charts for set-up time. After the recommended cure time is met, install and tighten fixture into place.



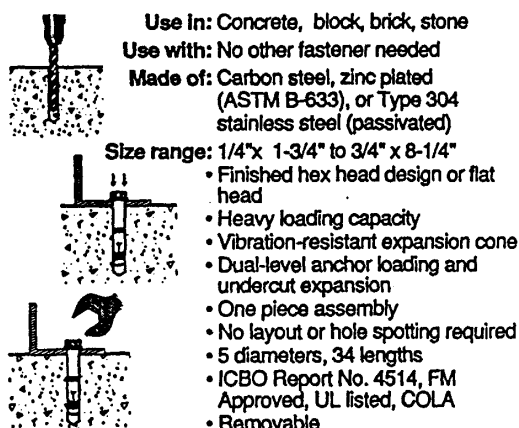
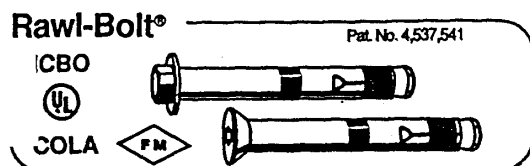
**A101
Dispenser**

ITW Ramset/Red Head

Call our toll free number 800-899-7890 or visit our web site for the most current product and technical information at www.ramset-redhead.com

RED HEAD 23

THE RAWL COMPANY, INC. - Example #1



Remove inspection tag. Do not expand before installation. Position fixture, drill hole. Insert Rawl-Bolt and drive flush with fixture. Tighten to recommended torque.

The Rawl-Bolt is a single-unit, vibration-resistant, removable bolt assembly with a finished hex or flat head design. As the anchor size is hole size, the Rawl-Bolt eliminates layout or hole-spotting. As the anchor is driven into the hole, the slotted, over-sized annular ring on the bottom of the cone is compressed until it mates perfectly with the hole. This action prevents the anchor from spinning while it is being tightened.

Expansion occurs at two levels within the drilled hole. First, the cone is pulled into the large triple-tined expansion sleeve, developing a mid-level, load bearing capacity over a large surface area. Further turning causes the threaded bolt to advance into the threads at the compressed end of the cone, forcing the four sections of the cone outward, driving them into the base material. This action develops a lower level undercut load-bearing capacity deep in the hole over a the full 360° area, greatly increasing the holding power of the anchor and reducing the tendency of the concrete to spall under heavy loading.

As the bolt enters the compressed threaded area of the cone, tremendous lateral forces are created between the concrete and the mating male and female threads, which keeps them locked together preventing loosening under even the most severe vibratory conditions.

The Rawl-Bolt is designed to draw the work tighter to the surface because of its unique, flexible, compression ring. As the anchor is being tightened, the nylon compression ring will press so that the material being fastened is tightly pressed against the face of the base material.

STAINLESS STEEL HEX HEAD RAWL-BOLT®

Stainless steel Rawl-Bolt Anchors are manufactured from Type 304 stainless steel.

| Cat. No. | Size | Drill Dia. | Min. Depth | Std. Box | Std. Ctn. | Wt./ 100 |
|----------|---------------|------------|------------|----------|-----------|----------|
| 5910 | 3/8" x 2-1/4" | 3/8" | 2" | 50 | 300 | 10 |
| 5914 | 3/8" x 3-1/2" | 3/8" | 2" | 50 | 300 | 12 |
| 5916 | 3/8" x 4" | 3/8" | 2" | 50 | 300 | 14 |
| 5930 | 1/2" x 2-3/4" | 1/2" | 2-1/2" | 50 | 200 | 16 |
| 5934 | 1/2" x 4-3/4" | 1/2" | 2-1/2" | 25 | 150 | 26 |
| 5944 | 5/8" x 5" | 5/8" | 2-3/4" | 15 | 90 | 47 |
| 5946 | 5/8" x 7" | 5/8" | 2-3/4" | 15 | 60 | 67 |
| 5954 | 3/4" x 5-1/4" | 3/4" | 3" | 15 | 60 | 70 |
| 5957 | 3/4" x 8-1/4" | 3/4" | 3" | 10 | 40 | 110 |

The published length is measured from below the washer to the end of the anchor.

CARBON STEEL FLAT HEAD RAWL-BOLT®

The flat head Rawl-Bolt has a hex key insert formed in the head of the bolt. Each box contains an allen wrench which matches the insert size.

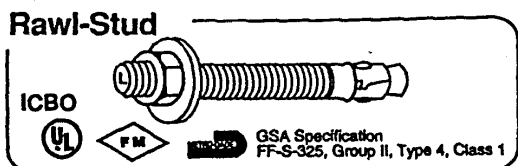
| | | | | | | |
|------|---------------|------|--------|----|-----|----|
| 6981 | 3/8" x 4" | 3/8" | 2" | 50 | 300 | 14 |
| 6982 | 3/8" x 5" | 3/8" | 2" | 50 | 300 | 17 |
| 6983 | 3/8" x 6" | 3/8" | 2" | 50 | 300 | 20 |
| 6984 | 1/2" x 4-3/4" | 1/2" | 2-1/2" | 25 | 150 | 26 |
| 6987 | 5/8" x 6" | 5/8" | 2-3/4" | 15 | 90 | 57 |

FIXTURE CLEARANCE HOLES

Since the Rawl-Bolt Anchor is designed to be driven through the fixture, the following table lists the minimum recommended clearance hole to be provided in the fixture. The clearance hole should be adjusted to allow for any coating applied to the fixture

| Anchor Size | 1/4" | 3/8" | 1/2" | 5/8" | 3/4" |
|----------------|-------|-------|-------|--------|--------|
| Clearance Hole | 5/16" | 7/16" | 9/16" | 11/16" | 13/16" |

THE RAWL COMPANY, INC. - Example #2

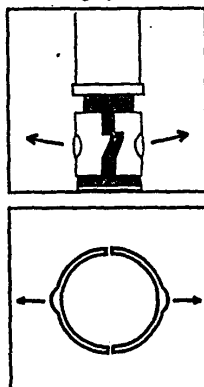


Use In: Concrete, stone
Use with: No other fastener needed
Made of: Carbon steel or stainless steel
Size range: 1/4" x 1-3/4" to 1-1/4" x 12"
• No layout or hole spotting required
• Patented inter-locking wedges
• FM approved, UL listed, ICBO Report No. 4514, Metro-Dade
• 89 diameters and lengths, other sizes on special order
• Also stocked in mechanically galvanized carbon steel, types 303 and 316 stainless steel

Position fixture, drill hole. Drive Rawl-Stud into hole until nut and washer are flush with fixture, and tighten.

The Rawl-Stud is a one-piece anchor available in carbon steel or stainless steel for installation in highly corrosive environments.

The patented dual inter-locking expansion wedges provide optimum performance. During installation of the Rawl-Stud, the inter-locking tabs on the wedges grip the anchor body firmly to prevent spinning of the anchor during the tightening process. As the anchor is tightened, the wedges distribute the compression load equally in lateral planes to prevent cocking of the anchor or premature failure of the concrete due to uneven distribution of the load.



The Rawl-Stud is available with a length identification mark stamped on the head of the anchor as shown below.

| Mark | A | B | C | D | E | F | G | H |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| From | 1 1/2 | 2 | 2 1/2 | 3 | 3 1/2 | 4 | 4 1/2 | 5 |
| Up to But Not Including | 2 | 2 1/2 | 3 | 3 1/2 | 4 | 4 1/2 | 5 | 5 1/2 |

| Mark | I | J | K | L | M | N | O | P |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| From | 5 1/2 | 6 | 6 1/2 | 7 | 7 1/2 | 8 | 8 1/2 | 9 |
| Up to But Not Including | 6 | 6 1/2 | 7 | 7 1/2 | 8 | 8 1/2 | 9 | 9 1/2 |

| Mark | Q | R | S | T | U | V | W | X | Y | Z |
|-------------------------|-------|----|----|----|----|----|----|----|----|----|
| From | 9 1/2 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| Up to But Not Including | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |

STAINLESS STEEL RAWL-STUD

Stainless Steel Rawl-Stud anchors are manufactured from AISI Type 303 and Type 316 steel (passivated). Additional sizes and corrosion resistant materials are available on a special order basis.

TYPE 303 STAINLESS STEEL RAWL-STUD

| Cat. No. | Size | Min. Depth | Thread Length | Std. Box | Std. Ctn. | Wt./100 |
|----------|---------------|------------|---------------|----------|-----------|---------|
| 7300 | 1/4" x 1-3/4" | 1-1/8" | 3/4" | 100 | 500 | 3 |
| 7302 | 1/4" x 2-1/4" | 1-1/8" | 1-1/4" | 100 | 500 | 3-1/2 |
| 7304 | 1/4" x 3" | 1-1/8" | 2" | 100 | 500 | 4-3/4 |
| 7310 | 3/8" x 2-1/4" | 1-3/4" | 1" | 50 | 250 | 8-3/4 |
| 7312 | 3/8" x 2-3/4" | 1-3/4" | 1-1/2" | 50 | 250 | 9-1/2 |
| 7313 | 3/8" x 3" | 1-3/4" | 1-3/4" | 50 | 250 | 10-3/4 |
| 7314 | 3/8" x 3-1/2" | 1-3/4" | 2-1/4" | 50 | 250 | 12 |
| 7315 | 3/8" x 3-3/4" | 1-3/4" | 2-1/2" | 50 | 250 | 12-3/4 |
| 7316 | 3/8" x 5" | 1-3/4" | 3-3/4" | 50 | 250 | 15-1/2 |
| 7320 | 1/2" x 2-3/4" | 2-1/4" | 1-1/4" | 50 | 200 | 18 |
| 7322 | 1/2" x 3-3/4" | 2-1/4" | 2-1/4" | 50 | 200 | 23 |
| 7323 | 1/2" x 4-1/2" | 2-1/4" | 3" | 50 | 200 | 30 |
| 7324 | 1/2" x 5-1/2" | 2-1/4" | 4" | 50 | 150 | 34 |
| 7326 | 1/2" x 7" | 2-1/4" | 5-1/2" | 25 | 100 | 44 |
| 7330 | 5/8" x 3-1/2" | 2-7/8" | 1-7/8" | 25 | 100 | 40 |
| 7332 | 5/8" x 4-1/2" | 2-7/8" | 2-7/8" | 25 | 100 | 54 |
| 7333 | 5/8" x 5" | 2-7/8" | 3-3/8" | 25 | 100 | 57 |
| 7334 | 5/8" x 6" | 2-7/8" | 4-3/8" | 25 | 25 | 64 |
| 7336 | 5/8" x 7" | 2-7/8" | 5-3/8" | 25 | 25 | 72 |
| 7338 | 5/8" x 8-1/2" | 2-7/8" | 1-5/8" | 25 | 25 | 84 |
| 7340 | 3/4" x 4-1/4" | 3-3/8" | 2-1/4" | 20 | 20 | 70 |
| 7341 | 3/4" x 4-3/4" | 3-3/8" | 2-3/4" | 20 | 20 | 76 |
| 7342 | 3/4" x 5-1/2" | 3-3/8" | 3-1/2" | 20 | 20 | 85 |
| 7344 | 3/4" x 6-1/4" | 3-3/8" | 4-1/4" | 20 | 20 | 95 |
| 7346 | 3/4" x 7" | 3-3/8" | 1-3/4" | 20 | 20 | 105 |
| 7348 | 3/4" x 8-1/2" | 3-3/8" | 1-3/4" | 10 | 10 | 120 |
| 7349 | 3/4" x 10" | 3-3/8" | 1-3/4" | 10 | 10 | 135 |
| 7361 | 1" x 6" | 4-1/2" | 2-3/8" | 10 | 10 | 170 |
| 7363 | 1" x 9" | 4-1/2" | 2-3/8" | 10 | 10 | 240 |
| 7365 | 1" x 12" | 4-1/2" | 2-3/8" | 10 | 10 | 300 |

TYPE 316 STAINLESS STEEL RAWL-STUD

| | | | | | | |
|------|---------------|--------|--------|----|-----|--------|
| 7610 | 3/8" x 2-1/4" | 1-3/4" | 1" | 50 | 250 | 8-3/4 |
| 7612 | 3/8" x 2-3/4" | 1-3/4" | 1-1/2" | 50 | 250 | 10-1/2 |
| 7614 | 3/8" x 3-1/2" | 1-3/4" | 2-1/4" | 50 | 250 | 12-1/2 |
| 7615 | 3/8" x 3-3/4" | 1-3/4" | 2-1/2" | 50 | 250 | 13 |
| 7616 | 3/8" x 5" | 1-3/4" | 3-3/4" | 50 | 250 | 17-1/4 |
| 7620 | 1/2" x 2-3/4" | 2-1/4" | 1-1/4" | 50 | 200 | 18 |
| 7622 | 1/2" x 3-3/4" | 2-1/4" | 2-1/4" | 50 | 200 | 24 |
| 7624 | 1/2" x 5-1/2" | 2-1/4" | 4" | 50 | 150 | 34 |
| 7626 | 1/2" x 7" | 2-1/4" | 5-1/2" | 25 | 100 | 44 |
| 7630 | 5/8" x 3-1/2" | 2-7/8" | 1-7/8" | 25 | 100 | 40 |
| 7632 | 5/8" x 4-1/2" | 2-7/8" | 2-7/8" | 25 | 100 | 54 |
| 7634 | 5/8" x 6" | 2-7/8" | 4-3/8" | 25 | 25 | 64 |
| 7638 | 5/8" x 8-1/2" | 2-7/8" | 6-7/8" | 25 | 25 | 84 |
| 7640 | 3/4" x 4-1/4" | 3-3/8" | 2-1/4" | 20 | 20 | 70 |
| 7642 | 3/4" x 5-1/2" | 3-3/8" | 3-1/2" | 20 | 20 | 85 |
| 7646 | 3/4" x 7" | 3-3/8" | 5" | 20 | 20 | 105 |
| 7648 | 3/4" x 8-1/2" | 3-3/8" | 1-3/4" | 10 | 10 | 120 |

The published length is the overall length of the anchor. Allow one anchor diameter for the nut and washer thickness when selecting a length.

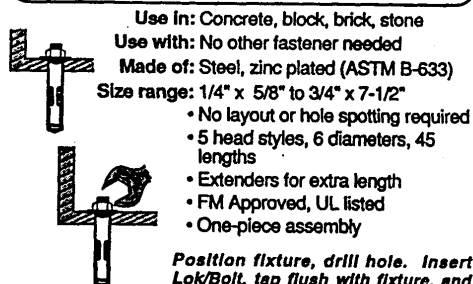
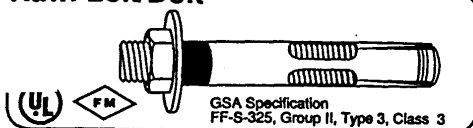
FIXTURE CLEARANCE HOLES FOR RAWL-STUD

For installations where the Rawl-Stud will be driven through the fixture, the following table lists the minimum recommended clearance hole to be provided in the fixture. The clearance holes should be adjusted to allow for any coating applied to the fixture

| Anchor Size | 1/4" | 3/8" | 1/2" | 5/8" | 3/4" | 7/8" | 1" | 1-1/4" |
|----------------|-------|-------|-------|--------|--------|--------|--------|--------|
| Clearance Hole | 5/16" | 7/16" | 9/16" | 11/16" | 13/16" | 15/16" | 1-1/8" | 1-3/8" |

THE RAWL COMPANY, INC. - Example #3

Rawl Lok/Bolt™



The Rawl Lok/Bolt is designed to draw the fixture tighter to the surface because of its unique, flexible, compression ring. As the anchor is being tightened, the nylon compression ring will compress, if necessary, so that the material being fastened is tightly secured against the face of the base material. Under load, the specially tapered bolt is drawn further into the expansion sleeve to develop increased locking action against the walls of the hole.

The all-steel, multi-purpose anchor bolt is intended for use in a wide range of concrete and masonry materials. Installation is fast and easy. Drill a hole of the same diameter as the Lok/Bolt, with fixture in place. Insert the Lok/Bolt, tap hole until flush with fixture and tighten with wrench or screwdriver to the recommended torque.

| Cat. No. | Size | Drill Dia. | Min. Depth | Std. Box | Std. Ctn. | WL/ 100 |
|----------|------|------------|------------|----------|-----------|---------|
|----------|------|------------|------------|----------|-----------|---------|

HEX NUT

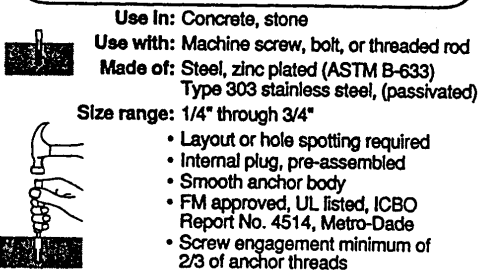
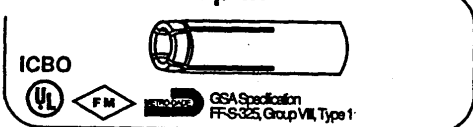
| | | | | | | |
|------|----------------|-------|--------|-----|------|--------|
| 5005 | 5/16" x 1-1/2" | 5/16" | 1-3/8" | 100 | 1000 | 4-1/4 |
| 5010 | 5/16" x 2-1/2" | 5/16" | 1-1/2" | 100 | 500 | 5-3/4 |
| 5015 | 3/8" x 1-7/8" | 3/8" | 1-5/8" | 50 | 500 | 7 |
| 5020 | 3/8" x 3" | 3/8" | 1-5/8" | 50 | 250 | 10 |
| 5022 | 3/8" x 4" | 3/8" | 1-5/8" | 50 | 250 | 16 |
| 5025 | 1/2" x 2-1/4" | 1/2" | 2-1/8" | 25 | 250 | 14 |
| 5030 | 1/2" x 3" | 1/2" | 2-1/4" | 25 | 250 | 17-1/4 |
| 5034 | 1/2" x 4" | 1/2" | 2-1/4" | 25 | 125 | 22 |
| 5033 | 1/2" x 5-1/4" | 1/2" | 2-1/4" | 25 | 125 | 27 |
| 5032 | 1/2" x 6" | 1/2" | 2-1/4" | 25 | 125 | 35 |
| 5035 | 5/8" x 2-1/4" | 5/8" | 2-1/8" | 25 | 125 | 25-1/2 |
| 5038 | 5/8" x 3" | 5/8" | 2-3/4" | 25 | 125 | 34 |
| 5040 | 5/8" x 4-1/4" | 5/8" | 2-3/4" | 10 | 100 | 41 |
| 5045 | 5/8" x 6" | 5/8" | 2-3/4" | 10 | 100 | 49 |
| 5050 | 3/4" x 2-1/2" | 3/4" | 2-1/8" | 10 | 100 | 46 |
| 5055 | 3/4" x 4" | 3/4" | 3-3/8" | 10 | 10 | 70 |
| 5060 | 3/4" x 5-3/4" | 3/4" | 3-3/8" | 10 | 10 | 90 |
| 5065 | 3/4" x 7-1/2" | 3/4" | 3-3/8" | 10 | 10 | 115 |

MULTIPLE USE KIT

| | | | | | | |
|------|------|------|--------|----|-----|----|
| 5660 | 1/2" | 1/2" | 2-1/4" | 25 | 250 | 10 |
|------|------|------|--------|----|-----|----|

The published length is measured from below the washer to the end of the anchor.

Rawl Steel Drop-In



Drill required hole. Insert anchor and tap flush with surface. Using setting tool (provided free with 100 anchors), set the Drop-In with several sharp hammer blows. Position the fixture, insert screw or bolt and tighten.

The Rawl Steel Drop-In is an all-steel, machine bolt anchor with a pre-assembled internal expander plug. This anchor design offers fast and easy installation and provides maximum holding power. It can be installed flush with the base material surface or sub-surface.

STEEL DROP-IN (INTERNAL PLUG)

| Cat. No. | Size | Drill Dia. | Min. Depth | Thread Depth | Std. Box | Std. Ctn. | WL/ 100 |
|----------|------|------------|------------|--------------|----------|-----------|---------|
| 6304 | 1/4" | 3/8" | 1-1/4" | 7/16" | 100 | 1000 | 2 |
| 6306 | 3/8" | 1/2" | 1-7/8" | 5/8" | 50 | 500 | 6 |
| 6308 | 1/2" | 5/8" | 2-3/8" | 13/16" | 50 | 250 | 12 |
| 6320 | 5/8" | 7/8" | 3" | 1-3/16" | 25 | 125 | 32 |
| 6312 | 3/4" | 1" | 3-1/2" | 1-3/8" | 10 | 50 | 48 |

STAINLESS STEEL DROP-IN (INTERNAL PLUG)

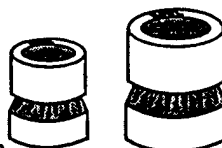
| | | | | | | | |
|------|------|------|--------|---------|-----|------|----|
| 6204 | 1/4" | 3/8" | 1-1/4" | 7/16" | 100 | 1000 | 2 |
| 6206 | 3/8" | 1/2" | 1-7/8" | 5/8" | 50 | 500 | 6 |
| 6208 | 1/2" | 5/8" | 2-3/8" | 13/16" | 50 | 250 | 12 |
| 6220 | 5/8" | 7/8" | 3" | 1-3/16" | 25 | 125 | 32 |
| 6212 | 3/4" | 1" | 3-1/2" | 1-3/8" | 10 | 50 | 48 |

One setting tool included with 100 anchors.

THE RAWL COMPANY, INC. - Example #4

Rawl Multi-Calk

GSA Specification*
FF-S-325, Group I, Type 1, Class 2

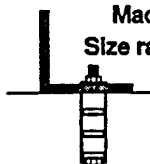


Use In: Concrete, brick, stone

Use with: Machine screw or bolt

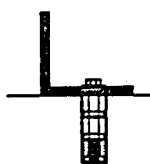
Made of: Lead and Zamac 7 alloy

Size range: 1/2" to 1"



- Layout or hole-spotting required
- Heavy Duty
- Threaded and plain style
- Screw engagement minimum of 2/3 of anchor threads

Stud Installation - Place bolt head in hole. Drop plain unit (cone end first) over bolt. Calk with tool until firmly set. Repeat for each successive unit. Position fixture. Thread on nut and tighten.



Threaded Installation - Assemble threaded unit onto threaded rod. Insert assembly into hole, cone end first. Calk with tool until firmly set. Add additional plain unit(s), calking each individually. Remove rod. Position fixture. Insert screw or bolt and tighten.

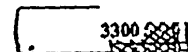
The Rawl Multi-Calk is a multiple-unit machine bolt anchor designed for the heavy duty loads.

| Cat. No. | Size | Drill Dia. | Std. Box | Std. Ctn. | Wt./ 100 |
|----------|------|------------|----------|-----------|----------|
| 9120 | 1/2" | 1" | 50 | 250 | 10 |
| 9125 | 5/8" | 1-1/8" | 50 | 250 | 14 |
| 9130 | 3/4" | 1-3/8" | 25 | 125 | 22 |
| 9135 | 7/8" | 1-1/2" | 25 | 25 | 32 |
| 9140 | 1" | 1-5/8" | 25 | 25 | 37 |

| Cat. No. | Size | Drill Dia. | Std. Box | Std. Ctn. | Wt./ 100 |
|----------|------|------------|----------|-----------|----------|
| 9170 | 1/2" | 1" | 50 | 250 | 15 |
| 9175 | 5/8" | 1-1/8" | 50 | 250 | 20 |
| 9180 | 3/4" | 1-3/8" | 25 | 125 | 35 |
| 9185 | 7/8" | 1-1/2" | 25 | 25 | 44 |
| 9190 | 1" | 1-5/8" | 25 | 25 | 54 |

STAR EXPANSION COMPANY - Example #1

DROP-GRIP® ANCHOR

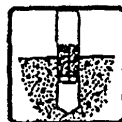


Specifications:

| Drop-Grip® Size | Drop-Grip® Length | Drill Bit Diameter | Drop-Grip® Thread Length | Bolt Diameter | Pullout Test in 4,000 P.S.I. CONCRETE Tensile |
|---------------------------------------------------------------------------------|----------------------|-----------------------|-----------------------------|------------------|-----------------------------------------------------|
| 1/4" | 1" | 3/8" | 7/16" | 1/4" | 2,300 lbs |
| 3/8" | 1-9/16" | 1/2" | 5/8" | 3/8" | 4,100 lbs |
| 1/2" | 2" | 5/8" | 1-3/16" | 1/2" | 6,000 lbs |
| 5/8" | 2-1/2" | 7/8" | 1-3/16" | 5/8" | 8,300 lbs |
| 3/4" | 3-3/16" | 1" | 1-3/16" | 3/4" | 13,600 lbs |
| Suggested safe working load is one-fourth (1/4) of the average proof test load. | | | | | |

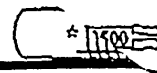
Note: All weight and load conditions described or referenced in this material were determined under laboratory conditions. Material and installation conditions vary in the field. To determine your holding factors, test product in actual conditions and material.

1. Drill hole to a depth at least equal to the length of the anchor.
2. Clean out hole of all dust and cuttings.
3. Insert anchor, knurled end first, and tap flush with surface.
4. Using a STAR Drop-In Setting Tool, set anchor with several solid hammer blows.
5. Position fixture over hole. Insert screw or bolt through fixture and tighten.



STAR EXPANSION COMPANY - Example #2

STEEL ANCHORS



Specifications:

| Steel Anchor Size | Steel Anchor Length | Steel Anchor Thread Depth | Drill Bit Diameter | Bolt Diameter | Pullout Test in 4000 P.S.I. concrete | |
|-------------------|---------------------|---------------------------|--------------------|---------------|--------------------------------------|------------|
| | | | | | Tensile | Shear |
| 1/4" | 1-3/32" | 3/8" | 7/16" | 1/4" | 2,080 lbs | 1,960 lbs |
| 3/8" | 1-17/32" | 9/16" | 9/16" | 3/8" | 2,560 lbs | 4,400 lbs |
| 1/2" | 2-1/32" | 13/16" | 11/16" | 1/2" | 4,440 lbs | 6,400 lbs |
| 5/8" | 2-15/32" | 15/16" | 27/32" | 5/8" | 6,280 lbs | 9,720 lbs |
| 3/4" | 3-1/2" | 1-7/32" | 1" | 3/4" | 9,640 lbs | 17,680 lbs |

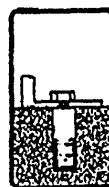
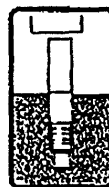
Suggested Safe Working Loads: 1/4 of the average maximum proof test load.

Note: All weights and load conditions described or referenced in this material were determined under laboratory conditions. Material and installation conditions vary in the field. To determine your holding factors, test product in actual conditions and materials.

Installation:

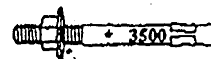
The Star Steel Anchor can be set flush or at varying depths for additional holding power. If set flush, an installation tool is not needed. Anchor can be set by applying hammer blows directly to the shield. The shield is expanded and anchored in place without the assistance of the object to be fastened. Objects bolted to this anchorage can be removed and/or replaced.

1. Drill hole of recommended diameter and depth into the concrete.
2. Clean out hole of all dust and cuttings.
3. Preassemble the expander plug, small end first, into the bore of the slotted end of the anchor. Tap lightly on the plug to ensure that it will not fall out of the anchor when putting it in the hole.
4. Place the Steel Anchor, expander plug first, into the hole.
5. Put the tapered end of the Setting Tool into the anchor and push down firmly against this. Using a heavy hand hammer, strike the Setting Tool with repeated sharp blows.
6. The anchor is completely set when it has fully expanded over the plug and set down tightly in the hole.
7. Position the object to be fastened over the anchor and bolt into place.



STAR EXPANSION COMPANY - Example #3

WEDGE-GRIP ANCHOR



Specifications:

| Wedge-Grip Size | Wedge-Grip Thread Length | Minimum Embedment | Drill Bit Diameter | Pull Out Test in 4000 P.S.I. Concrete | |
|-----------------|--------------------------|-------------------|--------------------|---------------------------------------|------------|
| | | | | Tensile | Shear |
| 1/4" | 3/4" | 1-1/8" | 1/4" | 1,640 lbs | 1,200 lbs |
| 3/8" | 7/8" or 1-1/8" | 1-5/8" | 3/8" | 3,040 lbs | 4,300 lbs |
| 1/2" | 1-1/8 or 1-1/4" | 2-1/4" | 1/2" | 4,300 lbs | 6,240 lbs |
| 5/8" | 1-1/2" | 2-3/4" | 5/8" | 6,020 lbs | 9,060 lbs |
| 3/4" | 1-3/4" | 3-1/4" | 3/4" | 8,620 lbs | 13,100 lbs |
| 7/8" | 1-3/4" | 4" | 7/8" | 12,000 lbs | 19,200 lbs |
| 1" | 2-1/4" | 4-1/2" | 1" | 17,000 lbs | 25,200 lbs |

* TORQUE
FT-LB.

Note: All weight and load conditions described or referenced in this material were determined under laboratory conditions. Material and installation conditions vary in the field. To determine your holding factors, test product in actual conditions and material.

* REFERENCED FROM ICBO REPORT NOS. 2876 + 3304
FOR ISO BOLT + ZINS WEDGE TYPE STUD BOLT ANCHORS

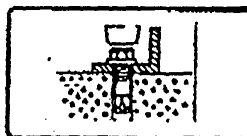
Installation:

The STAR Wedge-Grip Anchor requires no maximum hole depth. The depth of the hole in the concrete should be the length of the stud bolt minus the thickness of the material being fastened. This will result in some extra depth to accommodate a minor amount of concrete cuttings which you might not be able to clean out of the hole.

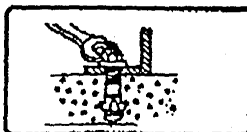
1. Drill hole into the concrete with a STAR carbide tipped masonry drill the same size as the Wedge-Grip Anchor. If the fixture being fastened is in place and being used as a template to locate the Wedge-Grip Anchor, the mounting hole in the fixture should afford clearance for the wedge clip on the stud.



2. Place the Wedge-Grip Anchor through the hole in the fixture and hammer drive it into the hole drilled in the concrete until the washer becomes flush with the surface of the fixture.



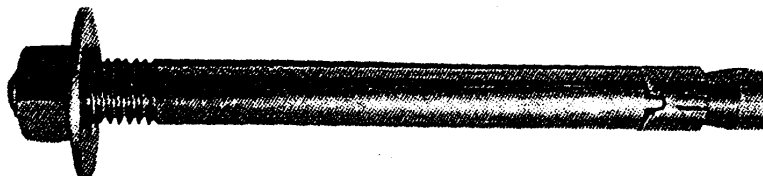
3. Turn the nut by hand until the unit is snugged up. Tighten the nut with a wrench, approximately three or four full turns, to complete the fastening.



WEJ-IT - Example #1



ANKR-TITE® / STUD ANCHORS



- Bolt size is hole size.
- Extra heavy duty washer.
- Safety shoulder to maximize holding ability.
- Flex fold ears to grip the concrete.

- Made by Wej-It in the U.S.A.
- Clip design enhances easy hole installation.
- Safe-sure grip speeds setting in three turns.
- Highest performance standard in the industry.

| ANCHOR DIAMETER AND LENGTH | MINIMUM EMBEDMENT (IN.) | MAXIMUM THICKNESS OF MATERIAL TO BE FASTENED (IN.) | QUANTITY BOX/CARTON | ZINC PLATED CATALOG NUMBER | MECHANICAL OR HOT DIP GALVANIZED CATALOG NUMBER | STAINLESS STEEL 302 HQ/303 CATALOG NUMBER | STAINLESS STEEL 316 CATALOG NUMBER |
|---------------------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------------|------------------------------------------------------------|--------------------------------------------------------------------|-------------------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------|
| 1/4 x 1 3/4 1/4 x 2 1/4 1/4 x 3 1/4 | 1 3/8 | 1/8 5/8 1 5/8 | 100/800 100/800 100/800 | AT1413 AT1421 AT1431 | | ATS1413 ATS1421 ATS1431 | ATSS1421 ATSS1431 |
| 3/8 x 2 1/4 3/8 x 2 3/4 3/8 x 3 3/8 x 3 3/4 3/8 x 5 | 1 3/4 | 1/8 5/8 7/8 1 5/8 2 7/8 | 50/400 50/400 50/400 50/400 50/300 | AT3821 AT3823 AT3830 AT3833 AT3850 | ATG3823 ATG3833 | ATS3821 ATS3823 ATS3830 ATS3833 ATS3850 | ATSS3823 ATSS3830 ATSS3833 |
| 1/2 x 2 3/4 1/2 x 3 3/4 1/2 x 4 1/4 1/2 x 5 1/2 1/2 x 7 | 2 1/8 | 1/8 1 1/8 1 5/8 2 7/8 4 3/8 | 25/200 25/200 25/200 25/150 25/150 | AT1223 AT1233 AT1241 AT1252 AT1270 | ATG1223 ATG1233 ATG1241 ATG1252 | ATS1223 ATS1233 ATS1241 ATS1252 ATS1270 | ATSS1223 ATSS1233 ATSS1241 ATSS1252 |
| 5/8 x 3 1/2 5/8 x 4 1/4 5/8 x 5 5/8 x 6 5/8 x 7 5/8 x 8 1/2 | 2 5/8 | 1/4 1 1 3/4 2 3/4 3 3/4 5 1/4 | 10/80 10/80 10/80 10/80 10/80 10/40 | AT5832 AT5841 AT5850 AT5860 AT5870 AT5882 | ATG5841 ATG5850 ATG5860 | ATS5832 ATS5841 ATS5850 ATS5860 ATS5870 ATS5882 | ATSS5841 ATSS5850 ATSS5860 |
| 3/4 x 4 1/4 3/4 x 4 3/4 3/4 x 5 1/2 3/4 x 7 3/4 x 8 1/2 3/4 x 10 3/4 x 12 | 3 1/4 | 1/4 3/4 1 1/2 3 4 1/2 6 8 | 10/80 10/80 10/60 10/60 10/40 10/40 5/20 | AT3441 AT3443 AT3452 AT3470 AT3482 AT3410 AT3412 | ATG3443 ATG3452 ATG3482 | ATS3441 ATS3443 ATS3452 ATS3470 ATS3482 ATS3410 ATS3412 | ATSS3443 ATSS3452 ATSS3470 |
| 1 x 6 1 x 9 1 x 12 | 4 1/2 | 1/2 3 1/2 6 1/2 | 5/30 5/20 5/20 | AT1060 AT1090 AT1012 | | ATS1060 ATS1090 ATS1012 | |

NOTE: Nuts and Washers included.
Zinc Plated to ASTM B-633 Type III, SCl. Clear Chromate added.
Grades 304, 316 Stainless available upon request. Unpublished sizes available upon request.
Mechanical Galvanized ASTM B-695 Type I, Class 25 (Furnished with Stainless Steel Expansion Ring).
Special lengths available upon request.
GSA Specification FF-S-325, Group II, Type 4, Class I.

WEJ-IT - Example #2

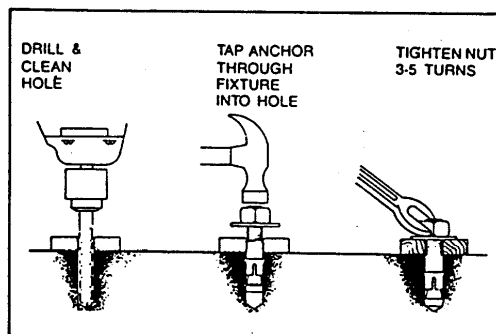


ANKR-TITE® / STUD ANCHORS

TECHNICAL INFORMATION

Ankr-tite® Installation Instructions

1. Always wear safety glasses.
2. Follow the drill manufacturer's safety instructions.
3. Use only solid carbide-tipped bits meeting the ANSI B94 tip diameter standard as shown on page 9.
4. Drill the hole perpendicular to the work surface. To assure full holding power, do not ream the hole or allow the drill to wobble.
5. Drill the hole as deep as the full length of the anchor, but not closer than two anchor diameters to the bottom (opposite) surface of the concrete. Through drilling is allowed when using sleeve anchors in hollow concrete block.
6. Clean the hole using compressed air and a wire brush. A clean hole is necessary for proper performance.
7. Assemble the washer and nut on the anchor so the nut protrudes slightly beyond the thread.
8. Tap the anchor through the fixture and into the hole, making sure the nut or head rests solidly against the fixture.
9. Tighten the nut or head 3-5 turns past the hand tight position.



Sources: U.S. Testing Co., Inc., Tulsa, Oklahoma. Tested to ASTM E488 Test Standard. Bit diameters to ANSI B94.

Use one-fourth of values shown for a recommended 4 - 1 safety factor. Test report, dated December 17, 1984, available on request.

THREAD LENGTH

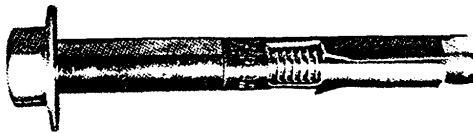
| Ankr-tite Stud Anchors | |
|------------------------|---------------|
| Dia. | Thread Length |
| 1/4 | 1" |
| 3/8 | 1 1/4" |
| 1/2 | 1 1/2" |
| 5/8 | 1 3/4" |
| 3/4 | 2" |
| 1 | 2 1/4" |

Thread UNC Class 2A.

WEJ-IT - Example #3



SLEEVE ANCHORS



- Bolt size is hole size.
- Fully assembled and ready to use.
- Flex-fold ears eliminates rotation in the hole.
- Unique pillar design maximizes clamping ability.
- Rapid expansion sets in three turns.
- Highest performance standards in the industry.
- Useable in all masonry material - poured concrete or hollow concrete block.

| HEAD STYLE | ANCHOR DIAMETER, AND LENGTH (IN.) | MINIMUM EMBEDMENT (IN.) | MAX. THICKNESS OF MATERIAL TO BE FASTENED (IN.) | QUANTITY BOX/CARTON | CATALOG NUMBER |
|--------------|-----------------------------------|-------------------------|-------------------------------------------------|---------------------|----------------|
| HEX NUT | 5/16 x 1 1/2 | 1 1/4 | 5/16 | 100/800 | HSA 5612 |
| | 5/16 x 2 1/2 | | 1 5/16 | 100/800 | HSA 5622 |
| | 3/8 x 1 7/8 | 1 1/2 | 3/8 | 50/400 | HSA 3813 |
| | 3/8 x 3 | | 1 1/2 | 50/400 | HSA 3830 |
| | 1/2 x 2 1/4 | 1 7/8 | 7/16 | 25/200 | HSA 1221 |
| | 1/2 x 3 | | 1 3/16 | 25/200 | HSA 1230 |
| | 1/2 x 4 | | 2 3/16 | 25/200 | HSA 1240 |
| | 5/8 x 2 1/4 | 2 | 1/2 | 25/200 | HSA 5821 |
| | 5/8 x 3 | | 1 1/4 | 25/200 | HSA 5830 |
| | 5/8 x 4 1/4 | | 2 1/2 | 10/80 | HSA 5841 |
| | 5/8 x 6 | | 3 3/4 | 10/80 | HSA 5860 |
| ROD COUPLING | 3/4 x 2 1/2 | 2 1/4 | 1/4 | 10/80 | HSA 3422 |
| | 3/4 x 4 | | 1 3/4 | 10/80 | HSA 3440 |
| | 3/4 x 6 1/4 | | 4 | 10/80 | HSA 3461 |
| | 3/8 x 1 7/8 | 1 1/2 | 3/8 | 50/400 | CSA 3813 |
| | 1/2 x 2 1/4 | 1 7/8 | 7/16 | 25/200 | CSA 1221 |



HEX NUT

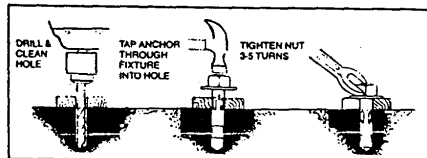


ROD COUPLING

NOTE: Zinc Plated to ASTM B-633 Type III, SCl. Clear Chromate added.
GSA Specification FF-S-325, Group II, Type 3, Class 3.
Thread UNC Class 1A.

Sleeve Anchors Installation Instructions

1. Always wear safety glasses.
2. Follow the drill manufacturer's safety instructions.
3. Use only solid carbide-tipped bits meeting the ANSI B94 tip diameter standard as shown on page 9.
4. Drill the hole perpendicular to the work surface. To assure full holding power, do not ream the hole or allow the drill to wobble.
5. Drill the hole as deep as the full length of the anchor, but not closer than two anchor diameters to the bottom (opposite) surface of the concrete. Through drilling is allowed when using sleeve anchors in hollow concrete block.
6. Clean the hole using compressed air and a wire brush. A clean hole is necessary for proper performance.
7. Assemble the washer and nut on the anchor so the nut protrudes slightly beyond the thread.
8. Tap the anchor through the fixture and into the hole, making sure the nut or head rests solidly against the fixture.
9. Tighten the nut or head 3-5 turns past the hand tight position.



Sources: U.S. Testing Co., Inc., Tulsa, Oklahoma. Tested to ASTM E488 Test Standard. Bit diameters to ANSI B94. Use one-fourth of values shown for a recommended 4 - 1 safety factor. Test range 2000 - 10000 psi.

WEJ-IT - Example #4



DROP-IN ANCHORS

| SIZE (IN.) | QUANTITY BOX/CARTON | ZINC PLATED CATALOG NUMBER | SETTING TOOLS CATALOG NUMBER |
|------------|------------------------|-------------------------------|---------------------------------|
| 1/4 | 100/1000 | WD-14 | ST-14 |
| 3/8 | 50/500 | WD-38 | ST-38 |
| 1/2 | 50/400 | WD-12 | ST-12 |
| 5/8 | 25/200 | WD-58 | ST-58 |
| 3/4 | 25/100 | WD-34 | ST-34 |

NOTE: To achieve proper setting and anchor performance, use only ANKRITITE Setting Tools. Zinc Plated to ASTM B-633 Type III, SCl. Fed. Spec. QQZ-325C, Type II, Class 3. Clear Chromate added. GSA Specification FF-S-325, Group VIII, Type I. Thread UNC Class 2A.

TECHNICAL INFORMATION

Maximum Tensile and Shear Values

As tested in 28-day unreinforced stone aggregate concrete.

| Anchor/NC Thread Size (in.) | Drill/Hole Size (in.) | Length Embedment (in.) | 4000 psi | |
|--------------------------------|--------------------------|------------------------------|----------|-------|
| | | | Tensile | Shear |
| 1/4 | 3/8 | 1 | 3399 | 1597 |
| 3/8 | 1/2 | 1 5/8 | 5456 | 3931 |
| 1/2 | 5/8 | 2 | 8785 | 6599 |
| 5/8 | 7/8 | 2 1/2 | 13980 | 11365 |
| 3/4 | 1 | 3 1/4 | 19353 | 16740 |

Sources: U.S. Testing Co., Inc., Tulsa, Oklahoma. Tested to ASTM E488 Test Standard. Bit diameters to ANSI B94.

Use one-fourth of values shown for a recommended 4 - 1 safety factor. Test report, dated March 27, 1985, available on request.



Drop-In Anchors Installation Instructions

1. Always wear safety glasses.
2. Follow the drill manufacturer's safety instructions.
3. Select the proper size drill bit from the chart below. Use only solid carbide-tipped bits meeting the ANSI B94 tip diameter standard as shown on page 9.
4. Drill the hole perpendicular to the work surface. To assure full holding power, do not ream the hole or allow the drill to wobble.
5. Drill the hole as deep as the full length of the anchor, but not closer than two anchor diameters to the bottom (opposite) surface of the concrete.
6. Clean the hole using compressed air and a wire brush. A clean hole is necessary for proper performance.
7. Tap the anchor into the hole, making sure that the top of the anchor is flush with or below the work surface.
8. Insert the setting tool provided into the threaded end of the anchor and expand the anchor by striking the end of the setting tool with a hammer. The anchor is set (fully expanded) when the shoulder of the setting tool touches the anchor. Full expansion is necessary for proper anchor performance.

WEJ-IT - Example #5



CHEMICAL FASTENING :
by UPAT

CHEMICAL MORTAR CARTRIDGE

Dimensions And Specifications

One UPAT® Chemical Mortar Cartridge provides 8.5 cubic inches of useable resin mortar. The following threaded rod specifications are examples of some applications. Virtually any application is possible. Product Bulletins giving specifications in greater detail (shallower embedments, deeper embedments, other fixture, etc.) are available upon request.

Test Data

The following test data is an example of the holding power of UPAT® Chemical Mortar when anchoring threaded rod to concrete. The results will vary for other fixtures and/or base materials. Product Bulletins giving test data in greater detail (shallower embedments, deeper embedments, other fixtures, etc.) are available upon request.

These test results are given purely as a guide. Note that concrete strengths may vary greatly. In all cases, it is recommended that tests to simulate actual conditions be carried out to determine suitability of UPAT® Chemical Mortar for a particular application.

| THREADED ROD SIZE | DRILL SIZE* | EMBEDMENT DEPTH | STUDS PER CARTRIDGE** |
|-------------------|-------------|-----------------|-----------------------|
| 1/4"-20 | 5/16" | 1-1/2" | 95 |
| 5/16"-18 | 3/8" | 1-7/8" | 56 |
| 3/8"-16 | 1/2" | 2-1/4" | 24 |
| 1/2"-13 | 5/8" | 3" | 14 |
| 5/8"-11 | 3/4" | 3-3/4" | 8 |
| 3/4"-10 | 7/8" | 4-1/2" | 5 |
| 7/8"-9 | 1" | 5-1/4" | 4 |
| 1"-8 | 1-1/8" | 6" | 2-1/2 |
| 1-1/4"-7 | 1-3/8" | 7-1/2" | 1-1/2 |

* Per ANSI B94.12-1977

** One cartridge provides 8.5 cubic inches mortar

| THREADED ROD SIZE | DRILL SIZE* | EMBEDMENT DEPTH | ULT. TENSILE LOAD** | ULT. SHEAR LOAD** |
|-------------------|-------------|-----------------|---------------------|-------------------|
| 1/4"-20 | 3/8" | 1-1/2" | 1,035 lbs. | 1,440 lbs. |
| 1/2"-13 | 5/8" | 3" | 7,595 lbs. | 6,685 lbs. |
| 3/4"-10 | 7/8" | 4-1/2" | 13,910 lbs. | 19,445 lbs. |
| 1"-8 | 1-1/8" | 6" | 19,465 lbs. | 26,775 lbs. |

* Per ANSI B94.12-1977

** SAE Grade 2 Threaded Rod tested in 4430 PSI (28 days) normal weight, hard rock aggregate concrete. Ultimate values are shown. Actual results may vary and are dependent upon proper installation. General industry practice for static loads is to use a safety factor of 4:1 to obtain working loads.

Tested in accordance with ASTM E488; test standards.

The UPAT® Chemical Mortar Cartridge is a unique, non-expanding chemical anchoring system that enables you to bond almost any kind of structural bar to almost any kind of building material... with no mess or complicated preparation!

Inside the cartridge are separate compartments containing premeasured amounts of polyester resin, quartz sand aggregate, and hardener. Pump the "T" handled plunger, and the three components are accurately, safely, and neatly mixed... all within the cartridge! Insert the activated cartridge into an ordinary caulking gun and you are ready to use!

The UPAT® Chemical Mortar Cartridge offers all the exceptional advantages of non-expanding chemical capsule anchoring:

- HIGH PULL-OUT LOADS
- IDEAL FOR VIBRATORY LOADS
- REDUCED CENTER-TO-CENTER AND CENTER-TO-EDGE DISTANCES
- MINIMAL "CREEP" OVER TIME
- USED WITH A WIDE VARIETY OF MATERIALS FROM SOFT BRICK TO HARD MARBLE OR GRANITE
- NO EXPANSION STRESS PLACED ON CONSTRUCTION MATERIALS
- CAN BE SET IN MOST WEATHER CONDITIONS
- COMPONENTS ARE PRE-MEASURED TO PREVENT JOINTING ERRORS AND ASSURE CORRECT DOI
- SEALS OUT HARMFUL CORROSIVES
- THE FOLLOWING ADDED ADVANTAGES

Fills Voids

Useful for problem areas. Fills voids, cracks,

fissures, crevices, and irregular holes to permanently anchor fixtures. Perfect for brick building restoration.

Versatile

Chemically bonds studs, dowels, rebar, wire, flat bars, hooks... almost any metal fixture to granite, marble, stone, concrete, hollow brick, and block. UPAT® Chemical Mortar Cartridge is the right choice for these problem fastenings:

- VERY SHALLOW OR VERY DEEP EMBEDMENTS
- SMALL DIAMETER FIXTURES
- ODD SHAPED FIXTURES (FLAT BARS, SQUARE TUBES, ETC.)
- FASTENINGS TO BRITTLE BASED MATERIALS

Easy, No-Fuss Mixing

Just pump the "T" handled plunger to mix the sealed components. When the mortar turns red, it is properly mixed and ready to use.

No Special Tools Required

All mixing hardware comes with the cartridge. Application of the activated mortar is performed with a standard caulking gun. Fixtures are installed by hand, with no need for special drive units or adaptors.

Storage Recommendations

For maximum shelf life, UPAT® Chemical Mortar Cartridges should be stored out of direct light in a controlled environment: 50°F to 100°F, well ventilated, and dry. Shelf life of up to one year is possible, but higher ambient temperatures and ultraviolet rays may shorten shelf life.

polyester resin and significantly reduce shelf life. An expiration date is shown on each cartridge.

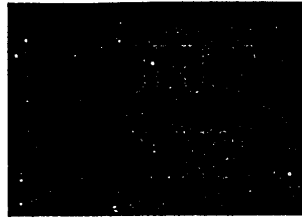
IMPORTANT

- WEAR SAFETY GOGGLES AND PROTECTIVE CLOTHING.
- AVOID FUMES AND CONTACT WITH EYES AND SKIN.
- Activated mortar must be completely used within the recommended working time. Working time will vary with temperature and other field conditions. (See maximum working time in chart below.) It is recommended that application preparations be completed before mixing cartridge.

| BASE MATERIAL TEMP. | MAXIMUM WORKING TIME | MINIMUM CURE TIME |
|-----------------------|----------------------|-------------------|
| 104°F | 5 min. | 20 min. |
| 68°F | 20 min. | 80 min. |
| 32°F | 120 min. | 360 min. |
| DO NOT USE BELOW 32°F | | |

- Do not disturb or load fastening until fully cured. Cure time will vary with temperature and other field conditions (see chart above).
- Using in concrete cured less than 7 days will greatly reduce anchor strength.
- Because dust in hole will significantly reduce fastening strength, operator must make special effort to clean hole thoroughly.
- When bonding smooth fixtures deform section of fixture to be embedded.
- Tubing should be plunger to prevent mortar

U.S. ANCHOR CORPORATION - Example #1



Buyline 6878

"We know U.S. Anchor has excellent products and prices but what we most appreciate is your great service and friendly voices."

Sharon Kubik
Youngstown Bolt & Supply
Youngstown, Ohio

The Kingpin Wedge Anchor is used for heavy duty fastening applications where high pullout values are required. The anchor and the hole diameter are the same, simplifying the anchor installation. The advanced design of the collar, with three protruding prongs to grip the interior of the hole, reduces the likelihood of the anchor's "spinning" during installation. In addition, hole depth is not critical, as the wedge is non-bottom bearing, although the hole must be at least as deep as the minimum embedment depth listed below. Proper installation requires cleaning out the hole. For maximum strength, the wedge anchor should be installed using a torque wrench set to the suggested level as provided in the instruction sheet. The wedge is used in a wide variety of structural applications, including fastening sheet metal, steel, aluminum angles or wood to concrete. Pipe-hanging, tilt-ups, bridges, elevator equipment, conveyors and highway construction frequently require the wedge type anchor. Due to its high resistance to vibratory loads, the wedge anchor is ideal for installing machinery, hand rails, dock bumpers & storage racks, etc. Wedge anchors are sold together with the appropriate nuts and washers, unassembled.

See ReCOIL Anchor for alternatives



| CARBON STEEL ITEM CODE | 304/304 STAINLESS STEEL ITEM CODE | 316 STAINLESS STEEL ITEM CODE | RECOIL GALVANIZED ITEM CODE | DRILLER & LENGTH | MINIMUM EMBEDMENT | MINIMUM LENGTH | BOX IN QUANTITY | WEIGHT (LBS.) PER 100 |
|------------------------|-----------------------------------|-------------------------------|-----------------------------|------------------|-------------------|----------------|-----------------|-----------------------|
| W1416 | W1416S | W1416S3 | | 1/4" x 1 3/4" | 1 1/8" | 3/4" | 100/1000 | 3.32 |
| W1422 | W1422S | W1422S3 | | 1/4" x 2 1/4" | 1 1/8" | 3/4" | 100/1000 | 3.92 |
| W1432 | W1432S | | | 1/4" x 3 1/4" | 1 1/8" | 3/4" | 100/1000 | 5.20 |
| W3822 | W3822S | | | 3/8" x 2 1/4" | 1 5/8" | 7/8" | 100/1000 | 8.22 |
| W3826 | W3826S | W3826S3 | | 3/8" x 2 3/4" | 1 5/8" | 1 1/8" | 100/1000 | 10.50 |
| W3830 | W3830S | W3830S3 | | 3/8" x 3" | 1 5/8" | 1 1/8" | 100/1000 | 11.36 |
| W3836 | W3836S | W3836S3 | | 3/8" x 3 3/4" | 1 5/8" | 1 1/8" | 100/1000 | 13.38 |
| W3850 | W3850S | W3850S3 | | 3/8" x 5" | 1 5/8" | 1 1/8" | 50/500 | 16.84 |
| W3864 | W3864S | | | 3/8" x 6 1/2" | 1 5/8" | 1 1/8" | 50/500 | 22.36 |
| W1226 | W1226S | W1226S3 | W1226G | 1/2" x 2 3/4" | 2 1/4" | 1 1/4" | 50/500 | 20.00 |
| W1236 | W1236S | W1236S3 | | 1/2" x 3 3/4" | 2 1/4" | 1 1/4" | 50/500 | 26.12 |
| W1242 | W1242S | W1242S3 | W1242G | 1/2" x 4 1/4" | 2 1/4" | 1 1/4" | 25/250 | 28.48 |
| W1254 | W1254S | W1254S3 | W1254G | 1/2" x 5 1/2" | 2 1/4" | 1 1/4" | 25/250 | 32.48 |
| W1270 | W1270S | W1270S3 | W1270G | 1/2" x 7" | 2 1/4" | 1 1/4" | 25/250 | 43.52 |
| W1284 | W1284S | | | 1/2" x 8 1/2" | 2 1/4" | 1 1/4" | 25/100 | 53.44 |
| W12100 | W12100S | | | 1/2" x 10" | 2 1/4" | 1 1/4" | 25/100 | 58.24 |
| W12120 | W12120S | | | 1/2" x 12" | 2 1/4" | 1 1/4" | 25/100 | 69.68 |
| W5834 | W5834S | W5834S3 | W5834G | 5/8" x 3 1/2" | 2 3/4" | 1 1/2" | 25/250 | 41.60 |
| W5844 | W5844S | W5844S3 | | 5/8" x 4 1/2" | 2 3/4" | 1 1/2" | 25/250 | 47.04 |
| W5850 | W5850S | W5850S3 | W5850G | 5/8" x 5" | 2 3/4" | 1 1/2" | 25/250 | 46.56 |
| W5860 | W5860S | W5860S3 | W5860G | 5/8" x 6" | 2 3/4" | 1 1/2" | 25/250 | 57.84 |
| W5870 | W5870S | W5870S3 | | 5/8" x 7" | 2 3/4" | 1 1/2" | 25/250 | 72.40 |
| W5884 | W5884S | W5884S3 | | 5/8" x 8 1/2" | 2 3/4" | 1 1/2" | 25/100 | 83.84 |
| W58100 | W58100S | | | 5/8" x 10" | 2 3/4" | 1 1/2" | 10/40 | 96.60 |
| W58120 | W58120S | | | 5/8" x 12" | 2 3/4" | 1 1/2" | 10/40 | 102.97 |
| W3442 | W3442S | W3442S3 | | 3/4" x 4 1/4" | 3 3/8" | 1 1/2" | 20/200 | 65.20 |
| W3446 | W3446S | W3446S3 | W3446G | 3/4" x 4 3/4" | 3 3/8" | 1 1/2" | 20/200 | 71.70 |
| W3454 | W3454S | W3454S3 | W3454G | 3/4" x 5 1/2" | 3 3/8" | 1 1/2" | 20/80 | 78.40 |
| W3462 | W3462S | | | 3/4" x 6 1/4" | 3 3/8" | 1 1/2" | 10/100 | 90.60 |
| W3470 | W3470S | W3470S3 | | 3/4" x 7" | 3 3/8" | 1 1/2" | 10/100 | 98.00 |
| W3484 | W3484S | W3484S3 | W3484G | 3/4" x 8 1/2" | 3 3/8" | 1 1/2" | 10/40 | 118.00 |
| W34100 | W34100S | | | 3/4" x 10" | 3 3/8" | 1 1/2" | 10/40 | 138.80 |
| W34120 | | | | 3/4" x 12" | 3 3/8" | 1 1/2" | 10/40 | 169.20 |
| W7860 | W7860S | | W7860G | 7/8" x 6" | 4" | 2 1/4" | 5/50 | 126.40 |
| W7880 | W7880S | | W7880G | 7/8" x 8" | 4" | 2 1/4" | 5/20 | 160.80 |
| W78100 | W78100S | | | 7/8" x 10" | 4" | 2 1/4" | 5/20 | 197.20 |
| W10060 | W10060S | | W10090G | 1" x 6" | 4 1/2" | 2 1/4" | 5/50 | 170.80 |
| W10090 | W10090S | | | 1" x 9" | 4 1/2" | 2 1/4" | 5/20 | 240.00 |
| W100120 | W100120S | | | 1" x 12" | 4 1/2" | 2 1/4" | 5/20 | 288.00 |
| W100150 | | | | 1" x 15" | 4 1/2" | 2 1/4" | BULK | 366.40 |
| W11490 | | | | 1 1/4" x 9" | 5 5/8" | 3 1/4" | BULK | 367.60 |
| W114120 | | | | 1 1/4" x 12" | 5 5/8" | 3 1/4" | BULK | 460.00 |

U.L. Listed, FM Approved, ICBO, GSA Spec. FF-S-325 Group II, Type 4 Class I, Los Angeles City Approval. DOT Approvals may vary on file. Utility Approvals on file.

*Other sizes of 316 S/S available upon special request.

Minimum embedment for satisfactory anchor performance is 4 1/2 bolt diameters. Deeper embedments will yield higher tension and shear capacity.

CEB CORPORATION - Example #1



GREATER HOLDING POWER!

Projections on the spring steel expansion collar of CEB's WedgeStud anchor dig into the concrete when the anchor is tapped into a pre-drilled hole. As the nut is tightened, the anchor pulls up, expanding the collar and securing the fixture. The more load applied to the anchor, the greater the expansion and the greater the holding power.

FAST, EASY INSTALLATION

The drilled hole diameter is the same size as the anchor diameter, which saves drilling time and reduces drill bit costs. The depth of the drilled hole is not critical as the anchor does not have to bottom in the hole to be set.

ELIMINATES HOLE SPOTTING AND REPOSITIONING OF FIXTURES

Holes can be drilled through the mounting holes of the fixture and the anchors can then be tapped into place and tightened.

ZINC AND CHROMATE PLATING

WedgeStuds are supplied with a zinc and chromate plating for extra protection. These anchors are also available with other platings or in stainless steel for special environmental requirements.

WIRE

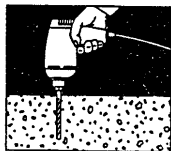
The wedge locking principle is ideally suited to overhead tie wire applications. The more weight hung from CEB's Tie Wire Anchor, the more the collar expands, increasing the holding power. No setting tools are required. The Tie Wire Anchor accommodates wire or rod up to one quarter inch in diameter. For loads over 500 lbs., it is best to set the Tie Wire WedgeStud by a pull with a claw hammer.

All sizes I.C.B.O. approved

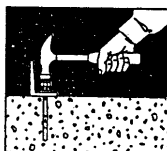
**the greater the load
the tighter the anchor**

FAST, SIMPLE INSTALLATION

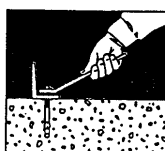
Select anchor long enough to accommodate thickness of fixture and nut, plus minimum imbedment indicated.



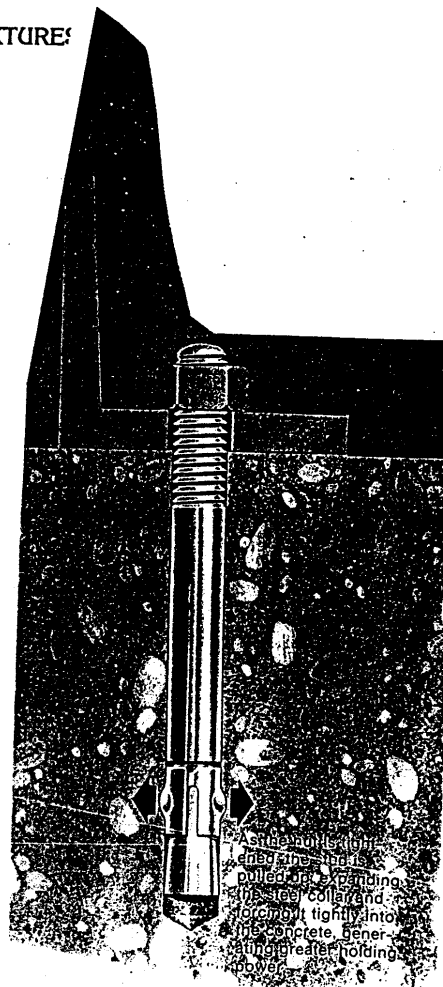
1. Drill hole the same diameter as WedgeStud. Hole can be drilled directly through mounting hole of fixture. The depth of hole should accommodate minimum recommended im-



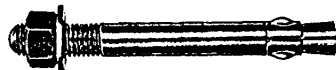
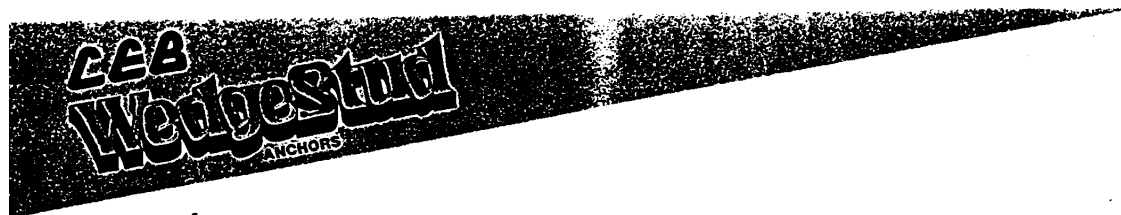
2. Insert WedgeStud and tap into hole so that at least six threads are below the top surface of fixture.



3. Tighten the nut. Resistance will increase quickly after three or four complete turns.



CEB CORPORATION - Example #2

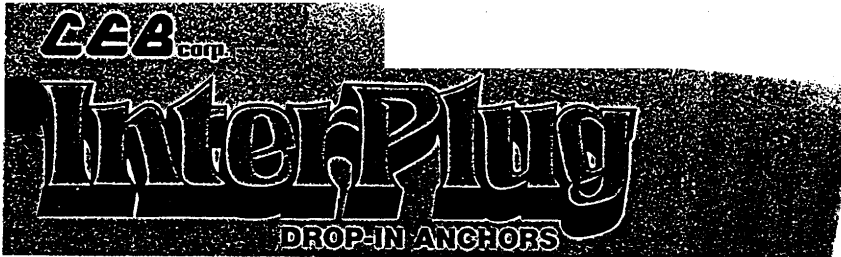


WedgeStud ANCHORS SIZES and SPECIFICATIONS

| STOCK NUMBER | SIZE (Inches) | THREAD LENGTH | HOLE SIZE | MINIMUM EMBEDMENT | QTY PER BOX/CARTON | WEIGHT PER 100 |
|--------------|---------------|---------------|-----------|-------------------|--------------------|----------------|
| 8025-15 | 1/4 x 1-5/8 | 3/4" | 1/4" | 1-1/8" | 100/900 | 3.4 lbs. |
| 8025-21 | 1/4 x 2-1/4 | 3/4" | 1/4" | 1-1/8" | 100/900 | 4.2 lbs. |
| 8025-30 | 1/4 x 3 | 3/4" | 1/4" | 1-1/8" | 100/900 | 5.5 lbs. |
| 8037-21 | 3/8 x 2-1/8 | 7/8" | 3/8" | 1-5/8" | 100/600 | 9.3 lbs. |
| 8037-23 | 3/8 x 2-3/4 | 1-1/8" | 3/8" | 1-5/8" | 100/600 | 10.0 lbs. |
| 8037-30 | 3/8 x 3-3/4 | 1-1/8" | 3/8" | 1-5/8" | 100/600 | 14.0 lbs. |
| 8037-50 | 3/8 x 5 | 1-1/8" | 3/8" | 1-5/8" | 50/300 | 17.8 lbs. |
| 8050-23 | 1/2 x 2-3/4 | 1-1/8" | 1/2" | 2-1/4" | 50/300 | 20.8 lbs. |
| 8050-33 | 1/2 x 3-3/4 | 1-1/4" | 1/2" | 2-1/4" | 50/200 | 26.0 lbs. |
| 8050-57 | 1/2 x 5-1/2 | 1-1/4" | 1/2" | 2-1/4" | 25/150 | 36.0 lbs. |
| 8050-70 | 1/2 x 7 | 1-1/4" | 1/2" | 2-1/4" | 25/100 | 44.0 lbs. |
| 8062-31 | 5/8 x 3-1/2 | 1-1/2" | 5/8" | 2-3/4" | 25/150 | 42.0 lbs. |
| 8062-41 | 5/8 x 4-1/2 | 1-1/2" | 5/8" | 2-3/4" | 25/150 | 55.0 lbs. |
| 8062-60 | 5/8 x 6 | 1-1/2" | 5/8" | 2-3/4" | 25/100 | 66.0 lbs. |
| 8062-81 | 5/8 x 8-1/2 | 1-1/2" | 5/8" | 2-3/4" | 25/75 | 88.0 lbs. |
| 8075-41 | 3/4 x 4-1/4 | 1-1/2" | 3/4" | 3-1/4" | 20/80 | 76.0 lbs. |
| 8075-51 | 3/4 x 5-1/2 | 1-1/2" | 3/4" | 3-1/4" | 20/80 | 86.0 lbs. |
| 8075-70 | 3/4 x 7 | 1-1/2" | 3/4" | 3-1/4" | 10/40 | 104.0 lbs. |
| 8075-81 | 3/4 x 8-1/2 | 1-1/2" | 3/4" | 3-1/4" | 10/30 | 124.0 lbs. |
| 8075-10 | 3/4 x 10 | 1-1/2" | 3/4" | 3-1/4" | 10/30 | 142.0 lbs. |
| 8087-60 | 7/8 x 6 | 2-1/4" | 7/8" | 4" | 10/40 | 128.0 lbs. |
| 8087-80 | 7/8 x 8 | 2-1/4" | 7/8" | 4" | 10/30 | 164.0 lbs. |
| 8087-10 | 7/8 x 10 | 2-1/4" | 7/8" | 4" | 10/30 | 200.0 lbs. |
| 8087-12 | 7/8 x 12 | 2-1/4" | 7/8" | 4" | 5/15 | 236.0 lbs. |
| 8010-60 | 1 x 6 | 2-1/4" | 1" | 4-1/2" | 5/30 | 170.0 lbs. |
| 8010-90 | 1 x 9 | 2-1/4" | 1" | 4-1/2" | 5/15 | 240.0 lbs. |
| 8010-12 | 1 x 12 | 2-1/4" | 1" | 4-1/2" | 5/15 | 308.0 lbs. |
| 8014-90 | 1-1/4 x 9 | 3-1/4" | 1-1/4" | 5-1/2" | 5/15 | 372.0 lbs. |
| 8014-12 | 1-1/4 x 12 | 3-1/4" | 1-1/4" | 5-1/2" | 5/15 | 472.0 lbs. |

All stock numbers available in stainless steel.

CEB CORPORATION - Example #3



GREATER HOLDING POWER

InterPlug anchors generate maximum holding power in concrete and other masonry materials. The smooth-walled anchor mates totally with the concrete as the anchor expands, providing an exceptional friction fit and maximum resistance to pull out forces.

The anchor expands uniformly over a larger area than other drop-in anchors. Pressure is consequently distributed over a wider area, generating greater holding power while minimizing stress on the concrete.

EASY INSTALLATION

CEB's InterPlug anchors are easy to install. The pre-assembled, internal lug expander simplifies the setting of the anchor and eliminates any problems associated with dropped or lost plugs.

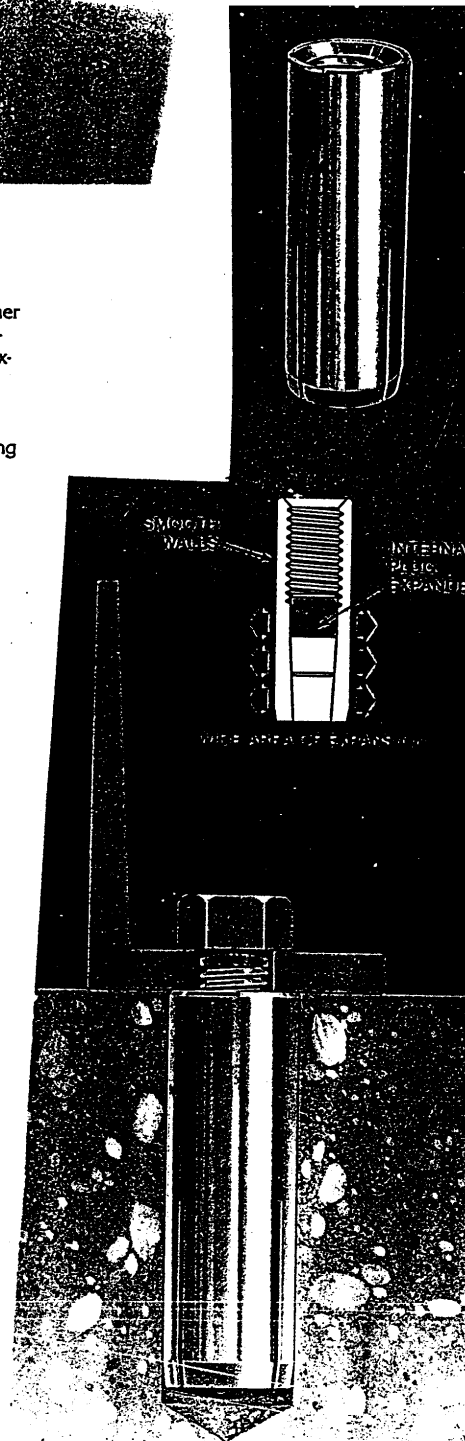
The expander plug can be set either with a hand-held hammer or with an impact tool. This permits the anchor to be set flush with the concrete or, if there is evidence of surface deterioration, the anchor can be set below the surface to maximize holding power and prevent spalling.

A smaller hole can be drilled for the InterPlug anchor than is required for other types of drop-in anchors.

ZINC PLATING

InterPlug anchors are zinc plated for corrosion resistance. Other platings are available upon request.

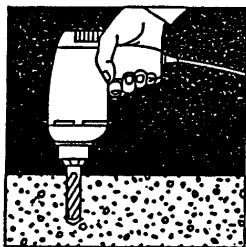
All sizes I.C.B.O. approved. U.L. and U.L.C. listed.



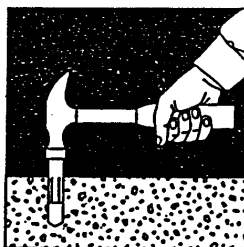
CEB CORPORATION - Example #4



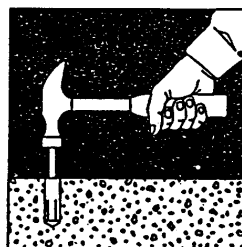
FAST, SIMPLE INSTALLATION



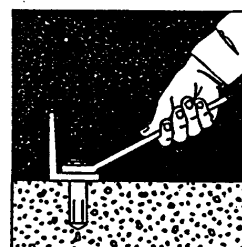
1. Drill hole 1/8" deeper than anchor length for flush mounting. Where surface deterioration is present drill hole somewhat deeper to permit anchor to be recessed below surface.



2. Drop InterPlug anchor into hole. If hole is slightly undersized, tap anchor in with hammer until it bottoms in hole.



3. To set expander plug, installation tool can be struck a few sharp blows with a hammer or an automatic air or electric tool can be used.



4. Place fixture in position, insert bolt and tighten.

SIZES and SPECIFICATIONS

| STOCK NUMBER | BOLT SIZE | DRILL BIT DIAMETER | ANCHOR LENGTH | THREAD DEPTH | WEIGHT PER 100 | BOX QTY | CARTON QTY | AVG. PULLOUT 4000 PSI CONCRETE** |
|--------------|-----------|--------------------|---------------|--------------|----------------|---------|------------|----------------------------------|
| 7025-00 | 1/4" | 5/16" | 1" | 7/16" | 1.5 lb. | 100 | 4000 | 2,220 lbs. |
| 7037-00 | 3/8" | 1/2" | 1-1/2" | 5/8" | 6.3 lb. | 50 | 1000 | 5,530 lbs. |
| 7060-00 | 1/2" | 5/8" | 2" | 11/16" | 11.8 lb. | 50 | 500 | 8,080 lbs. |
| 7062-00 | 5/8" | 7/8" | 2-1/2" | 7/8" | 31.2 lb. | 25 | 200 | 10,850 lbs. |
| 7075-00 | 3/4" | 1" | 3-1/8" | 1-3/8" | 46.0 lb. | 25 | 100 | 16,580 lbs. |

*For flush installation, add 1/8" to anchor length for minimum drilled hole depth.

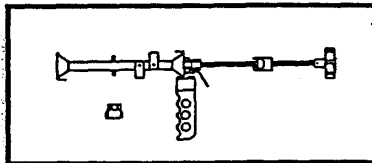
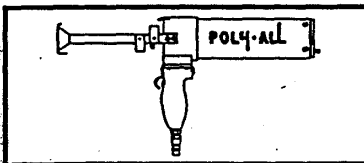
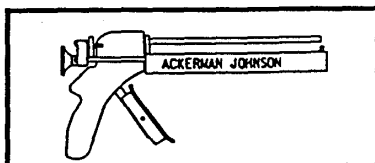
**Values shown are results by a certified independent laboratory. A safety ratio of 4 to 1 should be applied to above figures. All tests conducted in non-reinforced concrete. Meets or exceeds U.S. Federal Specifications FF-S-325, Group 2, Type 4, Class 1, Interim amendment—3 (Dated 7-16-65).

SETTING TOOLS

| STOCK NUMBER | ANCHOR BOLT SIZE |
|--------------|------------------|
| 7025-11 | 1/4" |
| 7037-11 | 3/8" |
| 7060-11 | 1/2" |
| 7062-11 | 5/8" |
| 7075-11 | 3/4" |

SIMPSON STRONG-TIE COMPANY, INC. - Example #1

4 POLY-ALL™ EPOXY ANCHORING SYSTEM

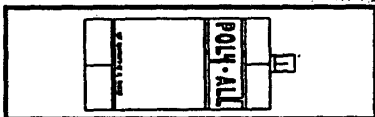


The Poly-All system consists of epoxy based chemical formulations, and unique mixing and dispensing tools that, in combination, provide a chemical anchor that is consistently reliable, has exceptional bonding strength and is easy and economical to use in a broad range of masonry applications.

DISPENSING TOOLS

| CATALOG NUMBER | DESCRIPTION | QUANTITY BOX | CTN | WEIGHT POUNDS EACH |
|----------------|--------------|--------------|-----|--------------------|
| PA-3000 | MANUAL | 1 | 1 | 6 |
| PA-4000 | PNEUMATIC | 1 | 1 | 8 |
| PA-3093 | MANUAL (New) | 1 | 1 | 6 |

POLY-ALL CARTRIDGE (22 FLUID OUNCE/39.6 CUBIC INCH)

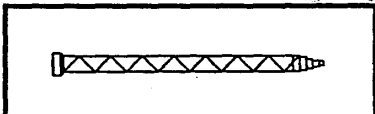


| | | | | |
|---------|----------------------------------------------------------------|---|----|---|
| PAC-12* | WARM WEATHER-RAPID CURE (Use at temperatures above 45°F) | 1 | 10 | 2 |
| PAC-14* | COLD WEATHER-RAPID CURE (Use at temperatures 25°F-45°F) | 1 | 10 | 2 |
| PA-12* | RENOVATION FORMULATION-RAPID CURE (For use with screens) | 1 | 10 | 2 |
| PAC-24* | WARM WEATHER-STANDARD CURE (Use at temperatures above 40°F) | 1 | 10 | 2 |

*International Conference of Building Officials (ICBO)-Date submitted and listing applied for September, 1991.

*City of Los Angeles (Renovation of Unreinforced Masonry Buildings)-Date submitted and approval applied for June, 1991.

DISPOSABLE MIXERS



| | | | |
|---------|-------------------------------------|------|----|
| PAM-37 | MIXER Holes Under 1/2" Dia. | Bulk | .1 |
| PAM-50 | MIXER Holes 1/2" Dia. and Larger | Bulk | .1 |
| PAM-58 | MIXER-High Volume Holes | Bulk | .1 |
| PAM-500 | MIXER COUPLING NUT | Bulk | .3 |

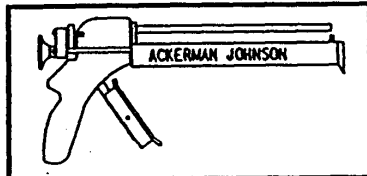
HOLES/CARTRIDGE SET

| BOLT DIAMETER | HOLE SIZE DIA. | DEPTH | POLY-ALL | MIDPAK | MINIPAK |
|---------------|----------------|-------|----------|--------|---------|
| 3/8 | 7/16 | 3-1/2 | 145 | 71 | 12 |
| 1/2 | 9/16 | 4-1/4 | 81 | 40 | 7 |
| 5/8 | 3/4 | 5 | 31 | 15 | 2-3/4 |
| 3/4 | 7/8 | 6-5/8 | 18 | 9 | 1-1/2 |
| 7/8 | 1 | 7-1/2 | 13 | 7 | 1-1/4 |
| 1 | 1-1/8 | 8-1/4 | 9 | 5 | 1 |

SIMPSON STRONG-TIE COMPANY, INC. - Example #2

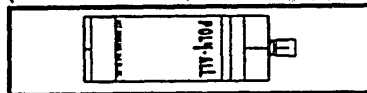
POLY-ALL™ EPOXY ANCHORING SYSTEM (cont'd) 5

MIDPAK TOOL



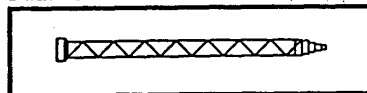
| CATALOG NUMBER | DESCRIPTION | QUANTITY BOX | CTN | WEIGHT POUNDS EACH |
|----------------|-------------|--------------|-----|--------------------|
| PA-3094 | MIDPAK TOOL | 1 | 1 | 2.8 |

MIDPAK CARTRIDGE (11 FLUID OUNCE/19.8 CUBIC INCH)



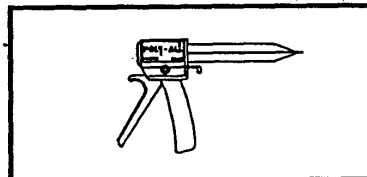
| | | | | |
|----------|----------------------------------------------------------------|---|----|------|
| PAC-1220 | WARM WEATHER-RAPID CURE (Use at temperatures above 45°F) | 1 | 10 | 1.1 |
| PAC-1420 | COLD WEATHER-RAPID CURE (Use at temperatures 25°F-45°F) | 1 | 10 | 1.1 |
| RA-1220 | RENOVATION FORMULATION-RAPID CURE (For use with screens) | 1 | 10 | 1.1 |
| PAC-2420 | WARM WEATHER-STANDARD CURE (Use at temperatures above 40°F) | 1 | 10 | 1.10 |

MIDPAK MIXER



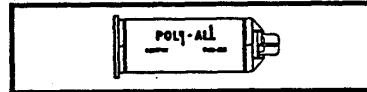
| | | | | |
|---------|-------------------------------------|------|--|----|
| PAM-37 | MIXER Holes Under 1/2" Dia. | Bulk | | .1 |
| PAM-50 | MIXER Holes 1/2" Dia. and Larger | Bulk | | .1 |
| PAM-58 | MIXER-High Volume Holes | Bulk | | .1 |
| PAM-500 | MIXER COUPLING NUT | Bulk | | .3 |

MINIPAK TOOL



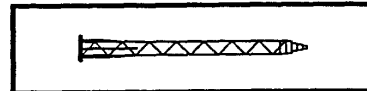
| | | | | |
|-------|--------------|---|---|----|
| PA-30 | MINIPAK TOOL | 1 | 1 | .6 |
|-------|--------------|---|---|----|

MINIPAK CARTRIDGE (1.7 FLUID OUNCE/3.1 CUBIC INCH)



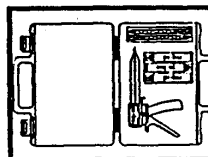
| | | | | |
|---------|----------------------------------------------------------------|----|----|----|
| PAC-120 | WARM WEATHER-RAPID CURE (Use at temperatures above 45°F) | 12 | 24 | .2 |
| PAC-240 | WARM WEATHER-STANDARD CURE (Use at temperatures above 40°F) | 12 | 24 | .2 |

MINIPAK MIXER



| | | | | |
|--------|---------------|------|--|----|
| PAM-25 | MIXING NOZZLE | Bulk | | .1 |
|--------|---------------|------|--|----|

MINIPAK STARTER KIT

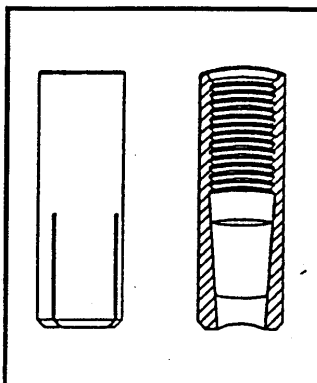


| | | | | |
|-------|-------------------------------------------------------------|---|---|-----|
| K-200 | (1) PA-30 (3) PAC-120 (6) PAM-25 (1) Carrying Case | 1 | 1 | 2.2 |
|-------|-------------------------------------------------------------|---|---|-----|

SIMPSON STRONG-TIE COMPANY, INC. - Example #3

10

DROP-IN ANCHOR



The Drop-In Anchor is an internally threaded expansion anchor which comes complete with a pre-assembled expander plug. The design of the anchor makes it ideal for flush mounted applications. The design of its four slots assures uniform and dependable expansion. Standard sizes accept 1/4-3/4 UNC bolts or threaded rod. Select sizes also available with internally tapped coil threads.

MATERIAL SPECIFICATIONS

Zinc Plated Carbon Anchors

Anchor Body—AISI 12L14 Cold Rolled Steel. Meeting the chemical requirements of ASTM A-108.

Expander Plug—AISI 12L14/1215 Cold Rolled Steel. Meeting the chemical requirements of ASTM A-108

Thread—UNC 2B/Coil Thread

Plating—In accordance with Federal Specifications QQ-Z-325-C, Type II, Class 3

Stainless Steel

Anchor Body—AISI 303. Meeting the chemical requirements of ASTM A-582

Expander Plug—AISI 303

Thread—UNC 2B

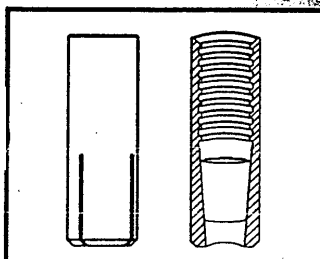
SELECTION CHART

| SIZE | CATALOG NUMBER | BOLT DIAMETER- THREADS PER INCH | RECOMMENDED SIZE OF HOLES | | ULTIMATE PULLOUT (lbs) | ULTIMATE SHEAR (lbs) |
|------|----------------|---------------------------------------|------------------------------|-------|------------------------------|----------------------------|
| | | | DIA | DEPTH | | |
| 1/4 | 763-25 | 1/4 - 20 | 7/16 | 1-1/8 | 2240 | 1520 |
| 3/8 | 763-37 | 3/8 - 16 | 1/2 | 1-5/8 | 4150 | 3370 |
| 1/2 | 763-50 | 1/2 - 13 | 5/8 | 2-1/4 | 6850 | 6075 |
| 5/8 | 763-62 | 5/8 - 11 | 7/8 | 2-3/4 | 12000 | 10800 |
| 3/4 | 763-75 | 3/4 - 11 | 1 | 3-1/4 | 16000 | 13500 |

Meets requirements of Federal Specification FFS-325, Group VIII, Type 1. Test results in approximately 4500 PSI Concrete.

ORDER INFORMATION

| SIZE | CATALOG NUMBER (CARBON STEEL) | CATALOG NUMBER (STAINLESS STEEL) | QUANTITY | | WEIGHT PER 100 (lbs) |
|------|-------------------------------------|----------------------------------------|----------|-----|----------------------------|
| | | | BOX | CTN | |
| 1/4 | 763-25 | 763-25SS | 100 | 500 | 3 |
| 3/8 | 763-37 | 763-37SS | 50 | 250 | 7 |
| 1/2 | 763-50 | 763-50SS | 50 | 200 | 13 |
| 5/8 | 763-62 | 763-62SS | 25 | 100 | 26 |
| 3/4 | 763-75 | 763-75SS | 20 | 80 | 50 |



COIL THREAD DROP-IN ANCHOR

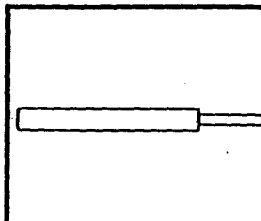
| SIZE | CATALOG NUMBER | QUANTITY BOX CTN | WEIGHT PER 100 (lbs) |
|------|----------------|---------------------|----------------------------|
| 1/2 | 763-50C | 50 200 | 13 |
| 3/4 | 763-75C | 20 80 | 50 |

SIMPSON STRONG-TIE COMPANY, INC. - Example #4

DROP-IN ANCHOR (*cont'd*)

11

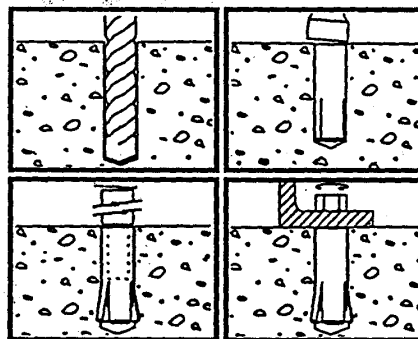
SETTING TOOL



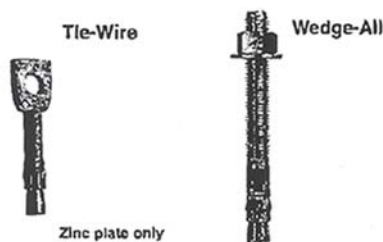
| SIZE | CATALOG NUMBER | QUANTITY PER BOX |
|------|----------------|------------------|
| 1/4 | 793-25-3 | Bulk |
| 3/8 | 793-37-3 | Bulk |
| 1/2 | 793-50-3 | Bulk |
| 5/8 | 793-62-3 | Bulk |
| 3/4 | 793-75-3 | Bulk |

INSTALLATION PROCEDURE

1. Drill hole 1/8" deeper than anchor length for flush mounting.
Where surface deterioration is present drill hole somewhat deeper to permit anchor to be recessed below surface.
2. Drop anchor into hole. If hole is slightly undersized, tap anchor in with hammer until it bottoms in hole.
3. To set expander plug, strike installation tool with hammer.
4. Place fixture in position, insert bolt and tighten.



WEDGE-ALL™ WEDGE ANCHORS



The Wedge-All is a non-bottom bearing, wedge style expansion anchor for use in solid concrete or grout filled masonry. A one-piece clip ensures uniform holding capacity that increases as tension is applied. A threaded stud version is available in nine diameters and several lengths. A single size tie-wire version is available for wire supported fixtures. Threaded studs are set by tightening the nut. Tie-wire anchors are set with the claw end of a hammer.

WEDGE-ALL SPECIAL FEATURES:

- One piece wrap around clip.
- Threaded end is chamfered for ease of starting nut.

MATERIAL: Carbon steel; stainless steel.

FINISH: Carbon steel anchors are available in zinc plated or mechanically galvanized.

INSTALLATION: • Hole in steel or metal fixtures to be mounted should exceed anchor diameter by 1/16" for 1/4" thru 3/4" diameter bolts, and 1/8" for all other diameters.

Caution: It is important to use the proper drill bit size. Oversized holes will make it difficult to set the anchor and will lower the anchor's load capacity.



Threaded studs:

- Drill a hole in the base material using a carbide tipped bit the same diameter as the anchor to be installed. The hole should be at least 1/4" deeper than the embedment required.
- Blow the hole clean using compressed air.
- Assemble the anchor with nut and washer so the top of the nut is flush with the top of the anchor. Place the anchor in the fixture and drive into the hole until washer and nut are tight against fixture.
- Tighten nut finger tight. Tighten to required torque setting.

Tie-Wire:

- Drill a hole at least 1 1/2" deep using a 1/4" carbide tipped bit.
- Drive the anchor into the hole until the head is seated against the base material.
- Set the anchor by prying/pulling with the claw end of the hammer.

CODES: ICBO ER 3631; SBCCI 9706; City of L.A. RR24682; Dade County 95-0511.04; Factory Mutual 1M6A0.AH; Underwriters Laboratories File Ex3605; Meets requirements of Federal Specifications A-A-1923A, Type 4. The Load Tables list values based upon results from the most recent testing and may not reflect those in the current ICBO and City of L.A. reports. Where these code jurisdictions apply, consult the current reports for applicable load values.

Material Specifications

| Anchor Component | Component Material | | | |
|------------------|-------------------------------------------|-------------------------------------------|-----------------|-----------------|
| | Zinc Plated Carbon Steel ¹ | Mechanically Galvanized ² | Stainless Steel | Stainless Steel |
| Anchor Body | Material meets minimum 70,000 psi tensile | Material meets minimum 70,000 psi tensile | Type 303/304 | Type 316 |
| Nut | Carbon Steel, ASTM A 563, Grade A | Carbon Steel, ASTM A 563, Grade A | Type 18-8 | Type 316 |
| Washer | Carbon Steel | Carbon Steel | Type 18-8 | Type 316 |
| Clip | Carbon Steel | Carbon Steel | Type 304 | Type 304 |

1. Zinc Plated meets ASTM B 633, Class SC 1 (Fe / Zn 5), Type III.
2. Mechanically galvanized meets ASTM B, Class 65, Type I.

Wedge-All Product Data

| Size (in) | Model No. | Thread Length (in) | Quantity | |
|-------------|-----------|--------------------|----------|-----|
| | | | Box | Ctn |
| 1/4 x 1 1/2 | TWD25112 | Eye dia is 1/4" | 100 | 500 |
| 1/4 x 1 3/4 | WA25134 | 1 1/4" | 100 | 500 |
| 1/4 x 2 | WA25214 | 1 1/4" | 100 | 500 |
| 1/4 x 2 1/2 | WA25314 | 2 1/4" | 100 | 500 |
| 3/8 x 2 1/2 | WA37214 | 1 1/2" | 50 | 250 |
| 3/8 x 2 3/4 | WA37234 | 1 1/2" | 50 | 250 |
| 3/8 x 3 | WA37300 | 1 1/2" | 50 | 250 |
| 3/8 x 3 1/2 | WA37334 | 2 1/2" | 50 | 250 |
| 3/8 x 5 | WA37500 | 3 1/2" | 50 | 200 |
| 3/8 x 7 | WA37700 | 1 1/2" | 50 | 200 |
| 1/2 x 2 1/2 | WA50234 | 1 1/2" | 25 | 125 |
| 1/2 x 3 1/2 | WA50334 | 2 1/2" | 25 | 125 |
| 1/2 x 4 1/2 | WA50414 | 2 1/2" | 25 | 100 |
| 1/2 x 5 1/2 | WA50512 | 4 1/2" | 25 | 100 |
| 1/2 x 7 | WA50700 | 5 1/2" | 25 | 100 |
| 1/2 x 8 1/2 | WA50812 | 6 | 25 | 50 |
| 1/2 x 10 | WA50100 | 6 | 25 | 50 |
| 1/2 x 12 | WA50120 | 6 | 25 | 50 |
| 3/4 x 3 1/2 | WA62312 | 1 1/2" | 20 | 80 |
| 3/4 x 4 1/2 | WA62412 | 2 1/2" | 20 | 80 |
| 3/4 x 5 | WA62500 | 3 1/2" | 20 | 80 |
| 3/4 x 6 | WA62600 | 4 1/2" | 20 | 80 |
| 3/4 x 7 | WA62700 | 5 1/2" | 20 | 80 |
| 3/4 x 8 1/2 | WA62812 | 6 | 20 | 40 |
| 3/4 x 10 | WA62100 | 6 | 10 | 20 |
| 3/4 x 12 | WA62120 | 6 | 10 | 20 |
| 1 x 4 1/2 | WA75414 | 2 1/2" | 10 | 40 |
| 1 x 4 3/4 | WA75434 | 2 1/2" | 10 | 40 |
| 1 x 5 1/2 | WA75512 | 3 1/2" | 10 | 40 |
| 1 x 6 1/2 | WA75614 | 4 1/2" | 10 | 40 |
| 1 x 7 | WA75700 | 5 1/2" | 10 | 40 |
| 1 x 8 1/2 | WA75812 | 6 | 10 | 20 |
| 1 x 10 | WA75100 | 6 | 10 | 20 |
| 1 x 12 | WA75120 | 6 | 5 | 10 |
| 1 x 8 | WA87600 | 2 1/2" | 5 | 20 |
| 1 x 8 | WA87800 | 2 1/2" | 5 | 10 |
| 1 x 10 | WA87100 | 2 1/2" | 5 | 10 |
| 1 x 12 | WA87120 | 2 1/2" | 5 | 10 |
| 1 x 6 | WA16000 | 2 1/2" | 5 | 20 |
| 1 x 8 | WA19000 | 2 1/2" | 5 | 10 |
| 1 x 12 | WA11200 | 2 1/2" | 5 | 10 |
| 1 1/2 x 9 | WA12590 | 2 1/2" | 5 | 10 |
| 1 1/2 x 12 | WA12512 | 2 1/2" | 5 | 10 |
| 1 1/2 x 12 | WA15012 | 3 1/2" | 5 | 10 |

1. The published length is the overall length of the anchor. Allow one anchor diameter for the nut and washer thickness plus the fixture thickness when selecting a length.
2. Some anchors shown are also available in mechanically galvanized, 303, 304 and 316 stainless steel. Call for availability.
3. Special lengths are available on request. Load values apply as long as minimum embedment depths are satisfied.

Length Identification Head Marks on Wedge-Alls (corresponds to length of anchor - inches).

| Mark | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z |
|-------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|----|----|----|----|----|----|----|----|
| From | 1 1/2 | 2 | 2 1/2 | 3 | 3 1/2 | 4 | 4 1/2 | 5 | 5 1/2 | 6 | 6 1/2 | 7 | 7 1/2 | 8 | 8 1/2 | 9 | 9 1/2 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| Up To But Not Including | 2 | 2 1/2 | 3 | 3 1/2 | 4 | 4 1/2 | 5 | 5 1/2 | 6 | 6 1/2 | 7 | 7 1/2 | 8 | 8 1/2 | 9 | 9 1/2 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |



WEDGE-ALL™ WEDGE ANCHORS

Tension and Shear Loads for Wedge-All Anchors in Normal-Weight Concrete

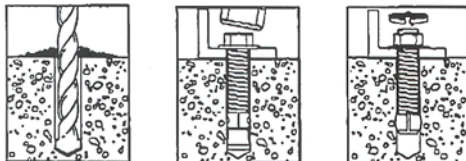
| Size | Embed. Depth in. (mm) | Critical Spacing in. (mm) | Tension Load | | | | | | Shear Load | | | Install. Torque ft-lbs (N-m) |
|-----------------|--------------------------------|------------------------------------|----------------------------|------------------------|---------------------|----------------------------|------------------------|---------------------|----------------------------|------------------------|---------------------|---------------------------------------|
| | | | f'c >= 2000 psi (13.8 MPa) | | | f'c >= 4000 psi (27.6 MPa) | | | f'c >= 2000 psi (13.8 MPa) | | | |
| | | | Ultimate lbs. (kN) | Std. Dev. lbs. (kN) | Allow. lbs. (kN) | Ultimate lbs. (kN) | Std. Dev. lbs. (kN) | Allow. lbs. (kN) | Ultimate lbs. (kN) | Std. Dev. lbs. (kN) | Allow. lbs. (kN) | |
| 1/4 (6.4) | 1 1/8 (28.6) | 4 1/2 (114.3) | 680 (3.0) | 167 (0.7) | 170 (0.8) | 950 (4.3) | 233 (1.0) | 240 (1.1) | 920 (4.1) | 47 (0.2) | 230 (1.0) | 8 (10.8) |
| | 2 1/4 (57.2) | 9 (228.6) | 1,920 (8.5) | 286 (1.3) | 480 (2.1) | 2,320 (10.3) | 105 (0.5) | 580 (2.6) | • | • | 230 (1.0) | |
| 3/8 (9.5) | 1 3/4 (44.5) | 7 (177.8) | 1,560 (6.9) | 261 (1.2) | 390 (1.7) | 2,880 (12.8) | 588 (2.6) | 720 (3.2) | 2,280 (10.1) | 96 (0.4) | 570 (2.5) | 30 (40.7) |
| | 2 5/8 (66.7) | 10 1/2 (265.7) | 3,360 (14.9) | 464 (2.1) | 840 (3.7) | 5,440 (24.2) | 553 (2.5) | 1,360 (6.0) | 4,220 (18.8) | 384 (1.7) | 1,055 (4.7) | |
| | 3 3/8 (85.7) | 13 1/2 (342.9) | 3,680 (16.4) | 585 (2.6) | 920 (4.1) | 5,440 (24.2) | 318 (1.4) | 1,360 (6.0) | • | • | 1,055 (4.7) | |
| | 2 1/4 (57.2) | 9 (228.6) | 3,280 (14.6) | 871 (3.9) | 820 (3.6) | 6,280 (28.3) | 849 (3.8) | 1,320 (5.9) | 6,560 (29.2) | 850 (3.8) | 1,640 (7.3) | |
| 1/2 (12.7) | 3 3/8 (85.7) | 13 1/2 (342.9) | 6,040 (26.9) | 654 (2.9) | 1,510 (6.7) | 9,840 (43.8) | 1,303 (5.8) | 2,460 (10.9) | 8,160 (36.3) | 880 (3.9) | 2,040 (9.1) | 60 (81.3) |
| | 4 1/2 (114.3) | 18 (457.2) | 6,960 (31.0) | 839 (3.7) | 1,740 (7.7) | 11,840 (52.7) | 2,462 (11.0) | 2,960 (13.2) | • | • | 2,040 (9.1) | |
| 5/8 (15.9) | 2 3/4 (69.9) | 11 (279.4) | 4,520 (20.1) | 120 (0.5) | 1,130 (5.0) | 8,600 (38.3) | 728 (3.2) | 2,150 (9.6) | 8,720 (38.8) | 1,699 (7.6) | 2,180 (9.7) | 80 (122.0) |
| | 4 1/2 (114.3) | 18 (457.2) | 8,200 (36.5) | 612 (2.7) | 2,050 (9.1) | 15,720 (69.9) | 1,224 (5.4) | 3,930 (17.5) | 12,570 (55.9) | 396 (1.8) | 3,140 (14.0) | |
| | 5 1/2 (139.7) | 22 (558.8) | 8,200 (36.5) | 639 (2.8) | 2,050 (9.1) | 15,720 (69.9) | 1,116 (5.0) | 3,930 (17.5) | • | • | 3,140 (14.0) | |
| | 3 3/8 (85.7) | 13 1/2 (342.9) | 6,760 (30.1) | 1,462 (6.5) | 1,690 (7.5) | 9,960 (44.3) | 1,324 (5.9) | 2,490 (11.1) | 11,360 (50.5) | 792 (3.5) | 2,840 (12.6) | |
| 3/4 (19.1) | 5 (127.0) | 20 (508.0) | 10,040 (44.7) | 544 (2.4) | 2,510 (11.2) | 15,760 (70.1) | 1,550 (6.9) | 3,940 (17.5) | 18,430 (82.0) | 1,921 (8.5) | 4,605 (20.5) | 150 (203.4) |
| | 6 3/4 (171.5) | 27 (685.8) | 10,040 (44.7) | 1,588 (7.1) | 2,510 (11.2) | 17,000 (75.6) | 1,668 (7.4) | 4,250 (18.9) | • | • | 4,605 (20.5) | |
| 7/8 (22.2) | 3 7/8 (98.4) | 15 1/2 (393.7) | 7,480 (33.3) | 821 (3.7) | 1,870 (8.3) | 10,720 (47.7) | 1,253 (5.6) | 2,680 (11.9) | 13,760 (61.2) | 2,059 (9.2) | 3,440 (15.3) | 200 (271.2) |
| | 7 7/8 (200.0) | 31 1/2 (800.1) | 17,040 (75.8) | 1,565 (7.0) | 4,260 (18.9) | 20,320 (90.4) | 2,401 (10.7) | 5,080 (22.6) | 22,300 (99.2) | 477 (2.1) | 5,575 (24.8) | |
| 1 (25.4) | 4 1/2 (114.3) | 18 (457.2) | 15,400 (68.5) | 2,440 (10.9) | 3,850 (17.1) | 15,680 (69.7) | 1,876 (8.3) | 3,920 (17.4) | 22,519 (100.2) | 1,156 (5.1) | 5,630 (25.0) | 300 (406.7) |
| | 9 (228.6) | 38 (914.4) | 20,760 (92.3) | 3,116 (13.9) | 5,190 (23.1) | 30,080 (133.8) | 1,612 (7.2) | 7,520 (33.5) | 25,380 (112.9) | 729 (3.2) | 6,345 (28.2) | |
| 1 1/4 (31.8) | 5 5/8 (142.9) | 22 1/2 (571.5) | 15,160 (67.4) | 1,346 (6.0) | 3,790 (16.9) | 24,760 (110.1) | 625 (2.8) | 6,190 (27.5) | 29,320 (130.4) | 2,099 (9.3) | 7,330 (32.6) | 400 (542.3) |
| | 9 1/2 (241.3) | 38 (965.2) | 20,160 (89.7) | 3,250 (14.5) | 5,040 (22.4) | 48,920 (217.6) | 1,693 (7.5) | 12,230 (54.4) | • | • | 7,330 (32.6) | |
| 1 1/2 (38.1) | 9 1/2 (241.3) | 38 (965.2) | • | • | 5,040 (22.4) | • | • | 12,230 (54.4) | • | • | 7,330 (32.6) | 400 (542.3) |

- The allowable loads listed are based on a safety factor of 4.0.
- Allowable loads may be increased by 33 1/3% for short term loading due to wind or seismic forces.
- Refer to pages 50 & 51 for allowable load adjustment factors for spacing and edge distance.
- Drill bit used in base material to be same diameter as anchor.
- Hole to be 1/4" deeper than required embedment.
- Allowable tension load may be interpolated for concrete compressive strengths between 2000 psi and 4000 psi.
- 1/4" loads apply to Tie-Wire and Wedge-All.

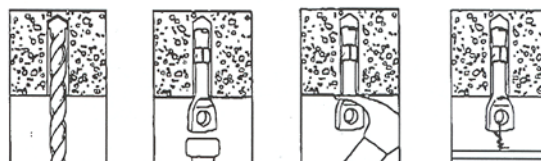
Wedge-All Installation Data

| Wedge-All Dia. (in) | 1/4 | 3/8 | 1/2 | 5/8 | 3/4 | 1 | 1 1/4 | 1 1/2 |
|---------------------------|-----|-----|-----|-------|-------|-------|-------|-------|
| Bit Size (in) | 1/4 | 3/8 | 1/2 | 5/8 | 3/4 | 1 | 1 1/4 | 1 1/2 |
| Fixture Hole (in) | 3/8 | 1/2 | 3/4 | 1 1/4 | 1 1/2 | 1 3/4 | 2 1/4 | 2 3/4 |
| Wrench Size (in) | 3/8 | 1/2 | 3/4 | 1 1/4 | 1 1/2 | 1 3/4 | 2 1/4 | 2 3/4 |

Wedge-All Installation Sequence



Tie-Wire Installation Sequence



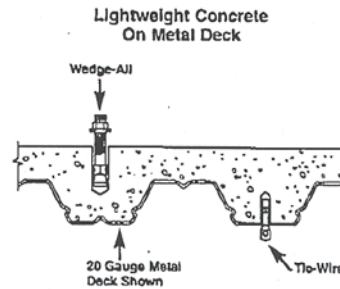
WEDGE-ALL™ WEDGE ANCHORS



Tension Loads for Wedge-All (and Tie-Wire) Anchors in Lightweight Concrete on Metal Deck

| Size | Embed. Depth | Tension Load (Install in Concrete) | | | Tension Load (Install through Metal Deck) | | | Install Torque ft-lbs (N-m) |
|--------------------|-----------------|---------------------------------------|------------------------|---------------------|----------------------------------------------|------------------------|---------------------|-----------------------------------|
| | | Fc ≥ 3000 psi (20.7 MPa) | | | Fc ≥ 3000 psi (20.7 MPa) | | | |
| | | Concrete | | | Concrete | | | |
| In. (mm) | In. (mm) | Ultimate lbs. (kN) | Std. Dev. lbs. (kN) | Allow. lbs. (kN) | Ultimate lbs. (kN) | Std. Dev. lbs. (kN) | Allow. lbs. (kN) | |
| 1/4 (TWD) (6.4) | 1 1/2 (38.1) | ● | ● | ● | 1,440 (6.4) | 167 (0.7) | 360 (1.6) | ● |
| 1/2 (12.7) | 2 1/4 (57.2) | 3,880 (17.3) | 228 (1.0) | 970 (4.3) | 3,850 (17.2) | 564 (2.5) | 985 (4.3) | 60 (81.3) |
| | 3 3/8 (85.7) | 5,520 (24.6) | 766 (3.4) | 1,380 (6.1) | 4,100 (18.2) | 718 (3.2) | 1,025 (4.6) | |
| 5/8 (15.9) | 2 3/4 (69.9) | 5,920 (26.3) | 239 (1.1) | 1,480 (6.6) | 5,220 (23.2) | 370 (1.6) | 1,305 (5.8) | 90 (122.0) |
| 3/4 (19.1) | 3 3/8 (85.7) | 7,140 (31.8) | 537 (2.4) | 1,785 (7.9) | 6,600 (29.4) | 903 (4.0) | 1,650 (7.3) | 150 (203.4) |

See notes below



Shear Loads for Wedge-All (and Tie-Wire) Anchors in Lightweight Concrete on Metal Deck

| Size | Embed. Depth In. (mm) | Shear Load (Install in Concrete) | | | Shear Load (Install through Metal Deck) | | | Install Torque ft-lbs (N-m) |
|--------------------|--------------------------------|--------------------------------------|------------------------|---------------------|--------------------------------------------|------------------------|---------------------|--------------------------------------|
| | | F _c ≥ 3000 psi (20.7 MPa) | | | F _c ≥ 3000 psi (20.7 MPa) | | | |
| | | Concrete | | | Concrete | | | |
| | | Ultimate lbs. (kN) | Std. Dev. lbs. (kN) | Allow. lbs. (kN) | Ultimate lbs. (kN) | Std. Dev. lbs. (kN) | Allow. lbs. (kN) | |
| 1/4 (TWD) (6.4) | 1 1/2 (38.1) | ● | ● | ● | 1,660 (7.4) | 627 (2.8) | 415 (1.8) | ● |
| 1/2 (12.7) | 2 1/4 (57.2) | 5,575 (24.8) | 377 (1.7) | 1,395 (6.2) | 7,600 (33.8) | 100 (0.4) | 1,900 (8.5) | 60 (81.3) |
| 5/8 (15.9) | 2 3/4 (69.9) | 8,900 (39.6) | 742 (3.3) | 2,225 (9.9) | 8,560 (38.1) | 114 (0.5) | 2,140 (9.5) | 90 (122.0) |
| 3/4 (19.1) | 3 3/8 (85.7) | 10,400 (46.3) | 495 (2.2) | 2,600 (11.6) | 11,040 (49.1) | 321 (1.4) | 2,760 (12.3) | 150 (203.4) |

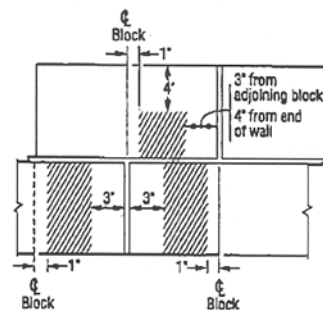
- The allowable loads listed are based on a safety factor of 4.0.
- Refer to pages 50 & 51 for allowable load adjustment factors for spacing and edge distance.
- Drill bit used in base material to be same diameter as anchor.
- Hole to be 1/2" deeper than required embedment.
- Concrete deck thickness must be minimum 1.5 x anchor embedment depth.

Tension and Shear Loads for Wedge-All Anchors in Grout Filled CMU (Anchor Installed in Horizontal Mortar Joint or Face Shell)

| Size In. (mm) | Embed. Depth In. (mm) | Min. End Dist. In. (mm) | Tension Load | | Shear Load | | Install. Torque ft-lbs (N-m) |
|---------------------|--------------------------------|----------------------------------|-----------------------|---------------------|-----------------------|---------------------|---------------------------------------|
| | | | Ultimate lbs. (kN) | Allow. lbs. (kN) | Ultimate lbs. (kN) | Allow. lbs. (kN) | |
| 3/8 (9.5) | 2 1/2 (63.5) | 3 (76.2) | 2,239 (10.0) | 560 (2.5) | 3,418 (15.2) | 855 (3.8) | 30 (40.7) |
| 1/2 (12.7) | 3 1/2 (88.9) | 3 (76.2) | 3,660 (16.3) | 915 (4.1) | 8,778 (39.0) | 2,195 (9.8) | 60 (81.3) |
| 5/8 (15.9) | 4 (101.6) | 3 (76.2) | 5,110 (22.7) | 1,275 (5.7) | 7,924 (35.2) | 1,980 (8.8) | 90 (122.0) |
| 3/4 (19.1) | 4 3/4 (120.7) | 3 (76.2) | 6,400 (28.5) | 1,600 (7.1) | 7,540 (33.5) | 1,885 (8.4) | 150 (203.4) |

- The allowable loads listed are based on a safety factor of 4.0.
- Listed loads may be applied to installations through a face shell with the following placement guidelines:
 - Minimum 4" from top of wall or end of wall.
 - Minimum 3" from vertical mortar joint.
 - Minimum 1" from vertical cell centerline.
- Values for 6 and 8 inch wide Grade N, Type II, lightweight, medium weight and normal weight concrete masonry units conforming to ASTM C90 and UBC Standard 21-4. Masonry units are to be fully grouted with coarse grout conforming to ASTM C476 with a minimum compressive strength of 2000 psi. Mortar and grout shall comply with section 2104 of the UBC.
- Embedment depth is measured from the outside face of the concrete masonry unit.
- Drill bit used in base material to be same diameter as anchor.
- Hole to be 1/2" deeper than required embedment.

Horizontal Mortar Joint/Face Shell Installation



Allowable anchor placement in grout filled CMU shown by shaded areas.

SUGGESTED SPECIFICATIONS:

Wedge anchors shall be a threaded stud with an integral cone expander and a single piece expansion clip. The stud shall be carbon steel with a minimum 70,000 psi tensile strength, type 18-8 or 316 stainless steel, as called for on the drawings. Anchors shall meet Federal Specification A-A-1923A, Type 4. Anchors shall be Wedge-Alls from Simpson Strong-Tie, Pleasanton, CA. Anchors shall be installed following Simpson Strong-Tie's instructions for Wedge-Alls.



WEDGE-ALL™ WEDGE ANCHORS

Example Calculation for a Group of two (2) Wedge-All Anchors:

Design a connection comprised of two (2) ¾" diameter Wedge-All 75614 anchors installed in $f'_c = 2000$ psi normal weight concrete as shown. The anchor group has an applied tension load of 1500 lbs. and an applied shear load of 2400 lbs. acting simultaneously.

Additional Data:

- Embedment depth = 5" (medium embedment).
- Spacing = $S_{act} = S1 = 10"$.
- Critical spacing for ¾" dia. anchor at medium embedment = $S_{cr} = 20"$.
- $S_{act} < S_{cr}$ (reduction for spacing must be applied).
- Critical edge distance for ¾" dia. anchor = $C_{cr} = 7 \frac{1}{2}"$.
- Edge distance = $C_{act} = C1 = C2 = 6"$.
- $C_{act} < C_{cr}$ (reduction for edge distance must be applied).

SOLUTION:

TENSION: Determine Uninfluened Allowable Tension load in $f'_c = 2000$ psi normal wt. concrete:

Uninfluened Allowable Tension = 2510 lbs.

Determine tension load adjustment factor for Spacing at medium embedment:

Embedment = 5"

$S_{act} = S1 = 10"$

$f_{ss1} = 0.95$ = Load Adjustment Factor

Determine tension load adjustment factor for Edge Distance:

$C_{act} = C1 = C2 = 6"$

$f_{ec1} = 0.90$ = Load Adjustment Factor

$f_{ec2} = 0.90$ = Load Adjustment Factor

Calculate Allowable Tension load per anchor:

Allowable Tension = (Uninfluened Allowable Tension) (f_{ss1}) (f_{ec1}) (f_{ec2})

Allowable Tension = (2510 lbs.) (0.95) (0.90) (0.90) = 1931 lbs per anchor

SHEAR: Determine Uninfluened Allowable Shear load in $f'_c = 2000$ psi normal wt. concrete:

Uninfluened Allowable Shear = 4605 lbs.

Determine shear load adjustment factor for Spacing at medium embedment:

Embedment = 5"

$S_{act} = S1 = 10"$

$f_{ss1} = 1.00$ = Load Adjustment Factor

Determine shear load adjustment factor for Edge Distance:

$C_{act} = C1 = C2 = 6"$

$f_{ec1} = 0.77$ = Load Adjustment Factor

$f_{ec2} = 0.77$ = Load Adjustment Factor

Calculate Allowable Shear load per anchor:

Allowable Shear = (Uninfluened Allowable Shear) (f_{ss1}) (f_{ec1}) (f_{ec2})

Allowable Shear = (4605 lbs.) (1.00) (0.77) (0.77) = 2730 lbs. per anchor

Check Anchor for Combined Tension and Shear:

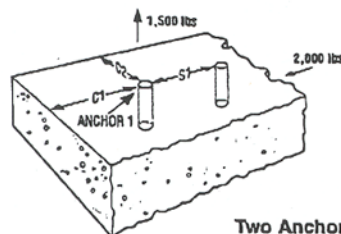
Unity Check:

(Applied Tension/Allowable Tension) + (Applied Shear/Allowable Shear) ≤ 1.00

Allowable Tension = 1931 lbs. x 2 = 3862 lbs. (two (2) anchors)

Allowable Shear = 2730 lbs. x 2 = 5460 lbs. (two (2) anchors)

(1500 / 3862) + (2400 / 5460) = 0.83 ≤ 1.00 ok



Two Anchor Layout

The allowable tension (or shear) value for a group of anchors is equal to the lowest (minimum) tension (or shear) value for a single anchor within the group multiplied by the number of anchors within the group.

Load Adjustment Factors

Load Adjustment Factors for minimum spacing have been determined by testing for shallow and deep embedment and by linear interpolation for medium embedment.

How to use these charts:

1. Locate the anchor size to be used for either a tension and/or shear load application.
2. Locate the edge distance and/or spacing at which the anchor is to be installed.
3. The load adjustment factor(s) will be the intersection of the row and column.
4. Multiply allowable load by applicable load adjustment factor(s).
5. Multiple adjustment factors for reduced edges and/or reduced spacing are multiplied together.

Load Adjustment Factors for Reduced Edge Distance for Wedge-All Anchors in Concrete

f_c - Edge Distance Tension

| Edge Dist. | Size | 1/4 | 3/8 | 1/2 | 5/8 | 3/4 | 7/8 | 1 | 1 1/4 | 1 1/2 |
|------------|-------------|-------|-------|------|-------|-------|-------|------|--------|-------|
| C_{cr} | | 2 1/2 | 3 3/4 | 5 | 6 1/4 | 7 1/2 | 8 3/4 | 10 | 12 1/2 | 15 |
| C_{act} | C_{min} | 1 | 1 1/2 | 2 | 2 1/2 | 3 | 3 1/2 | 4 | 5 | 6 |
| (In) | f_{smile} | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 |
| 1 | | 0.70 | | | | | | | | |
| 1 1/2 | | 0.80 | 0.70 | | | | | | | |
| 2 | | 0.90 | 0.77 | 0.70 | | | | | | |
| 2 1/2 | | 1.00 | 0.83 | 0.75 | 0.70 | | | | | |
| 3 | | | 0.90 | 0.80 | 0.74 | 0.70 | | | | |
| 3 1/2 | | | 0.97 | 0.85 | 0.78 | 0.73 | 0.70 | | | |
| 3 3/4 | | | 1.00 | 0.88 | 0.80 | 0.75 | 0.71 | | | |
| 4 | | | | 0.90 | 0.82 | 0.77 | 0.73 | 0.70 | | |
| 4 1/2 | | | | 0.95 | 0.86 | 0.80 | 0.76 | 0.73 | | |
| 5 | | | | 1.00 | 0.90 | 0.83 | 0.79 | 0.75 | 0.70 | |
| 5 1/2 | | | | | 0.94 | 0.87 | 0.81 | 0.78 | 0.72 | |
| 6 | | | | | 0.98 | 0.90 | 0.84 | 0.80 | 0.74 | 0.70 |
| 6 1/4 | | | | | 1.00 | 0.92 | 0.86 | 0.81 | 0.75 | 0.71 |
| 6 1/2 | | | | | | 0.93 | 0.87 | 0.83 | 0.76 | 0.72 |
| 7 | | | | | | 0.97 | 0.90 | 0.85 | 0.78 | 0.73 |
| 7 1/2 | | | | | | 1.00 | 0.93 | 0.88 | 0.80 | 0.75 |
| 8 | | | | | | | 0.96 | 0.90 | 0.82 | 0.77 |
| 8 1/2 | | | | | | | 0.99 | 0.93 | 0.84 | 0.78 |
| 8 3/4 | | | | | | | 1.00 | 0.94 | 0.85 | 0.79 |
| 10 | | | | | | | | 1.00 | 0.90 | 0.83 |
| 12 1/2 | | | | | | | | | 1.00 | 0.92 |
| 15 | | | | | | | | | | 1.00 |

f_c - Edge Distance Shear

| Edge Dist. | Size | 1/4 | 3/8 | 1/2 | 5/8 | 3/4 | 7/8 | 1 | 1 1/4 | 1 1/2 |
|------------|-------------|-------|-------|------|-------|-------|-------|------|--------|-------|
| C_{cr} | | 2 1/2 | 3 3/4 | 5 | 6 1/4 | 7 1/2 | 8 3/4 | 10 | 12 1/2 | 15 |
| C_{act} | C_{min} | 1 | 1 1/2 | 2 | 2 1/2 | 3 | 3 1/2 | 4 | 5 | 6 |
| (In) | f_{smile} | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| 1 | | 0.30 | | | | | | | | |
| 1 1/2 | | 0.53 | 0.30 | | | | | | | |
| 2 | | 0.77 | 0.46 | 0.30 | | | | | | |
| 2 1/2 | | 1.00 | 0.61 | 0.42 | 0.30 | | | | | |
| 3 | | | 0.77 | 0.53 | 0.39 | 0.30 | | | | |
| 3 1/2 | | | 0.92 | 0.65 | 0.49 | 0.38 | 0.30 | | | |
| 3 3/4 | | | 1.00 | 0.71 | 0.53 | 0.42 | 0.33 | | | |
| 4 | | | | 0.77 | 0.58 | 0.46 | 0.37 | 0.30 | | |
| 4 1/2 | | | | 0.88 | 0.67 | 0.53 | 0.43 | 0.36 | | |
| 5 | | | | 1.00 | 0.77 | 0.61 | 0.50 | 0.42 | 0.30 | |
| 5 1/2 | | | | | 0.86 | 0.69 | 0.57 | 0.48 | 0.35 | |
| 6 | | | | | 0.95 | 0.77 | 0.63 | 0.53 | 0.39 | 0.30 |
| 6 1/4 | | | | | 1.00 | 0.81 | 0.67 | 0.56 | 0.42 | 0.32 |
| 6 1/2 | | | | | | 0.84 | 0.70 | 0.59 | 0.44 | 0.34 |
| 7 | | | | | | 0.92 | 0.77 | 0.65 | 0.49 | 0.38 |
| 7 1/2 | | | | | | 1.00 | 0.83 | 0.71 | 0.53 | 0.42 |
| 8 | | | | | | | 0.90 | 0.77 | 0.58 | 0.46 |
| 8 1/2 | | | | | | | 0.97 | 0.83 | 0.63 | 0.49 |
| 8 3/4 | | | | | | | 1.00 | 0.85 | 0.65 | 0.51 |
| 10 | | | | | | | | 1.00 | 0.77 | 0.61 |
| 12 1/2 | | | | | | | | | 1.00 | 0.81 |
| 15 | | | | | | | | | | 1.00 |

1. C_{act} = actual edge distance at which anchor is installed.
2. C_{cr} = critical edge distance for 100% load.
3. C_{min} = minimum edge distance for reduced load.
4. f_c = percent of allowable load at actual edge distance.
5. f_{ecr} = percent of allowable load at critical edge distance. f_{ecr} is always = 1.00.
6. f_{cmin} = percent of allowable load at minimum edge distance.
7. $f_c = f_{cmin} + [(1 - f_{cmin}) (C_{act} - C_{min}) / (C_{cr} - C_{min})]$.



WEDGE-ALL™ WEDGE ANCHORS

Example Calculation for a Group of two (2) Wedge-All Anchors:

Design a connection comprised of two (2) 3/4" diameter Wedge-All 75614 anchors installed in $f'_c = 2000$ psi normal weight concrete as shown. The anchor group has an applied tension load of 1500 lbs. and an applied shear load of 2400 lbs. acting simultaneously.

Additional Data:

- Embedment depth = 5" (medium embedment).
- Spacing = $S_{act} = S1 = 10"$.
- Critical spacing for 3/4" dia. anchor at medium embedment = $S_{cr} = 20"$.
- $S_{act} < S_{cr}$ (reduction for spacing must be applied).
- Critical edge distance for 3/4" dia. anchor = $C_{cr} = 7 \frac{1}{2}"$.
- Edge distance = $C_{act} = C1 = C2 = 6"$.
- $C_{act} < C_{cr}$ (reduction for edge distance must be applied).

SOLUTION:

TENSION: Determine Uninfluened Allowable Tension load in $f'_c = 2000$ psi normal wt. concrete:

Uninfluened Allowable Tension = 2510 lbs.

Determine tension load adjustment factor for Spacing at medium embedment:

Embedment = 5"

$S_{act} = S1 = 10"$

$f_{ss1} = 0.95$ = Load Adjustment Factor

Determine tension load adjustment factor for Edge Distance:

$C_{act} = C1 = C2 = 6"$

$f_{ec1} = 0.90$ = Load Adjustment Factor

$f_{ec2} = 0.90$ = Load Adjustment Factor

Calculate Allowable Tension load per anchor:

Allowable Tension = (Uninfluened Allowable Tension) (f_{ss1}) (f_{ec1}) (f_{ec2})

Allowable Tension = (2510 lbs.) (0.95) (0.90) (0.90) = 1931 lbs per anchor

SHEAR: Determine Uninfluened Allowable Shear load in $f'_c = 2000$ psi normal wt. concrete:

Uninfluened Allowable Shear = 4605 lbs.

Determine shear load adjustment factor for Spacing at medium embedment:

Embedment = 5"

$S_{act} = S1 = 10"$

$f_{ss1} = 1.00$ = Load Adjustment Factor

Determine shear load adjustment factor for Edge Distance:

$C_{act} = C1 = C2 = 6"$

$f_{ec1} = 0.77$ = Load Adjustment Factor

$f_{ec2} = 0.77$ = Load Adjustment Factor

Calculate Allowable Shear load per anchor:

Allowable Shear = (Uninfluened Allowable Shear) (f_{ss1}) (f_{ec1}) (f_{ec2})

Allowable Shear = (4605 lbs.) (1.00) (0.77) (0.77) = 2730 lbs. per anchor

Check Anchor for Combined Tension and Shear:

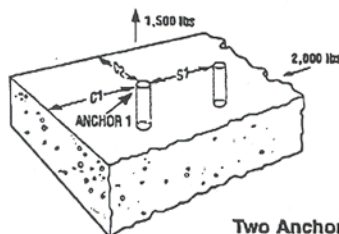
Unity Check:

(Applied Tension/Allowable Tension) + (Applied Shear/Allowable Shear) ≤ 1.00

Allowable Tension = 1931 lbs. x 2 = 3862 lbs. (two (2) anchors)

Allowable Shear = 2730 lbs. x 2 = 5460 lbs. (two (2) anchors)

$(1500 / 3862) + (2400 / 5460) = 0.83 < 1.00$ ok



Two Anchor Layout

The allowable tension (or shear) value for a group of anchors is equal to the lowest (minimum) tension (or shear) value for a single anchor within the group multiplied by the number of anchors within the group.

Load Adjustment Factors

Load Adjustment Factors for minimum spacing have been determined by testing for shallow and deep embedment and by linear interpolation for medium embedment.

How to use these charts:

1. Locate the anchor size to be used for either a tension and/or shear load application.
2. Locate the edge distance and/or spacing at which the anchor is to be installed.
3. The load adjustment factor(s) will be the intersection of the row and column.
4. Multiply allowable load by applicable load adjustment factor(s).
5. Multiple adjustment factors for reduced edges and/or reduced spacing are multiplied together.

Load Adjustment Factors for Reduced Edge Distance for Wedge-All Anchors in Concrete

f_c - Edge Distance Tension

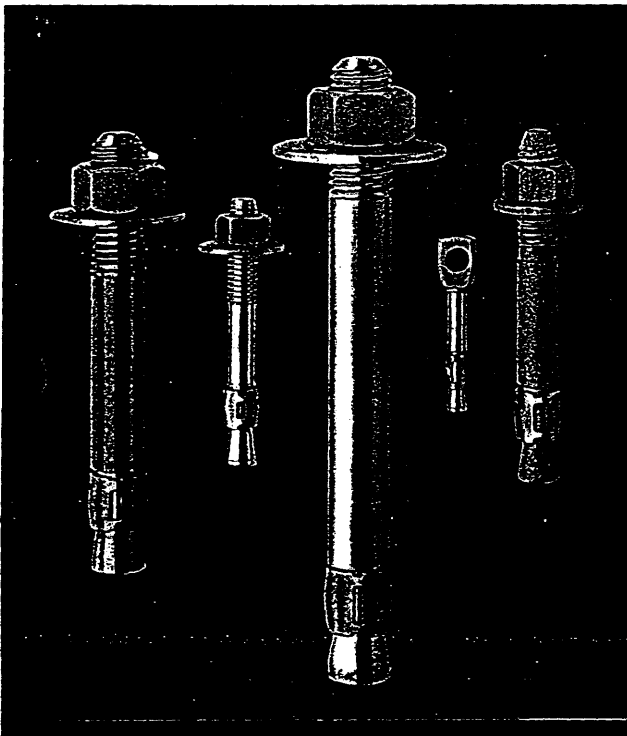
| Edge Dist. | Size | 1/4 | 3/8 | 1/2 | 5/8 | 3/4 | 7/8 | 1 | 1 1/4 | 1 1/2 |
|------------|-------------|-------|-------|------|-------|-------|-------|------|--------|-------|
| C_{cr} | | 2 1/2 | 3 3/4 | 5 | 6 1/4 | 7 1/2 | 8 3/4 | 10 | 12 1/2 | 15 |
| C_{act} | C_{min} | 1 | 1 1/2 | 2 | 2 1/2 | 3 | 3 1/2 | 4 | 5 | 6 |
| (In) | f_{smile} | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 |
| 1 | | 0.70 | | | | | | | | |
| 1 1/2 | | 0.80 | 0.70 | | | | | | | |
| 2 | | 0.90 | 0.77 | 0.70 | | | | | | |
| 2 1/2 | | 1.00 | 0.83 | 0.75 | 0.70 | | | | | |
| 3 | | | 0.90 | 0.80 | 0.74 | 0.70 | | | | |
| 3 1/2 | | | 0.97 | 0.85 | 0.78 | 0.73 | 0.70 | | | |
| 3 3/4 | | | 1.00 | 0.88 | 0.80 | 0.75 | 0.71 | | | |
| 4 | | | | 0.90 | 0.82 | 0.77 | 0.73 | 0.70 | | |
| 4 1/2 | | | | 0.95 | 0.86 | 0.80 | 0.76 | 0.73 | | |
| 5 | | | | 1.00 | 0.90 | 0.83 | 0.79 | 0.75 | 0.70 | |
| 5 1/2 | | | | | 0.94 | 0.87 | 0.81 | 0.78 | 0.72 | |
| 6 | | | | | 0.98 | 0.90 | 0.84 | 0.80 | 0.74 | 0.70 |
| 6 1/4 | | | | | 1.00 | 0.92 | 0.86 | 0.81 | 0.75 | 0.71 |
| 6 1/2 | | | | | | 0.93 | 0.87 | 0.83 | 0.76 | 0.72 |
| 7 | | | | | | 0.97 | 0.90 | 0.85 | 0.78 | 0.73 |
| 7 1/2 | | | | | | 1.00 | 0.93 | 0.88 | 0.80 | 0.75 |
| 8 | | | | | | | 0.96 | 0.90 | 0.82 | 0.77 |
| 8 1/2 | | | | | | | 0.99 | 0.93 | 0.84 | 0.78 |
| 8 3/4 | | | | | | | 1.00 | 0.94 | 0.85 | 0.79 |
| 10 | | | | | | | | 1.00 | 0.90 | 0.83 |
| 12 1/2 | | | | | | | | | 1.00 | 0.92 |
| 15 | | | | | | | | | | 1.00 |

f_c - Edge Distance Shear

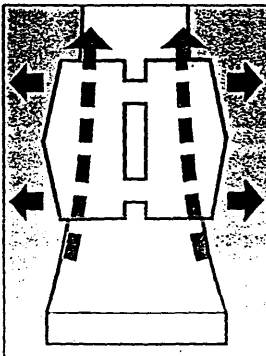
| Edge Dist. | Size | 1/4 | 3/8 | 1/2 | 5/8 | 3/4 | 7/8 | 1 | 1 1/4 | 1 1/2 |
|------------|-------------|-------|-------|------|-------|-------|-------|------|--------|-------|
| C_{cr} | | 2 1/2 | 3 3/4 | 5 | 6 1/4 | 7 1/2 | 8 3/4 | 10 | 12 1/2 | 15 |
| C_{act} | C_{min} | 1 | 1 1/2 | 2 | 2 1/2 | 3 | 3 1/2 | 4 | 5 | 6 |
| (In) | f_{smile} | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| 1 | | 0.30 | | | | | | | | |
| 1 1/2 | | 0.53 | 0.30 | | | | | | | |
| 2 | | 0.77 | 0.46 | 0.30 | | | | | | |
| 2 1/2 | | 1.00 | 0.61 | 0.42 | 0.30 | | | | | |
| 3 | | | 0.77 | 0.53 | 0.39 | 0.30 | | | | |
| 3 1/2 | | | 0.92 | 0.65 | 0.49 | 0.38 | 0.30 | | | |
| 3 3/4 | | | 1.00 | 0.71 | 0.53 | 0.42 | 0.33 | | | |
| 4 | | | | 0.77 | 0.58 | 0.46 | 0.37 | 0.30 | | |
| 4 1/2 | | | | 0.88 | 0.67 | 0.53 | 0.43 | 0.36 | | |
| 5 | | | | 1.00 | 0.77 | 0.61 | 0.50 | 0.42 | 0.30 | |
| 5 1/2 | | | | | 0.86 | 0.69 | 0.57 | 0.48 | 0.35 | |
| 6 | | | | | 0.95 | 0.77 | 0.63 | 0.53 | 0.39 | 0.30 |
| 6 1/4 | | | | | 1.00 | 0.81 | 0.67 | 0.56 | 0.42 | 0.32 |
| 6 1/2 | | | | | | 0.84 | 0.70 | 0.59 | 0.44 | 0.34 |
| 7 | | | | | | 0.92 | 0.77 | 0.65 | 0.49 | 0.38 |
| 7 1/2 | | | | | | 1.00 | 0.83 | 0.71 | 0.53 | 0.42 |
| 8 | | | | | | | 0.90 | 0.77 | 0.58 | 0.46 |
| 8 1/2 | | | | | | | 0.97 | 0.83 | 0.63 | 0.49 |
| 8 3/4 | | | | | | | 1.00 | 0.85 | 0.65 | 0.51 |
| 10 | | | | | | | | 1.00 | 0.77 | 0.61 |
| 12 1/2 | | | | | | | | | 1.00 | 0.81 |
| 15 | | | | | | | | | | 1.00 |

1. C_{act} = actual edge distance at which anchor is installed.
2. C_{cr} = critical edge distance for 100% load.
3. C_{min} = minimum edge distance for reduced load.
4. f_c = percent of allowable load at actual edge distance.
5. f_{ecr} = percent of allowable load at critical edge distance. f_{ecr} is always = 1.00.
6. f_{cmin} = percent of allowable load at minimum edge distance.
7. $f_c = f_{cmin} + [(1 - f_{cmin}) (C_{act} - C_{min}) / (C_{cr} - C_{min})]$.

COBRA PARABOLT® concrete anchors



The PARABOLT Concrete Anchor combines heavy duty static load fastening capability in an easy-to-install anchor that can be loaded as soon as installed: Just drill the hole, insert the PARABOLT Concrete Anchor, and tighten! As the nut is tightened, the "Parabolic" shaft is pulled up, wedging the one-piece stainless steel clip into the sides of the hole.



CHOICE OF BOLT MATERIALS

The PARABOLT Concrete Anchor is stocked in four types to meet a wide variety of anchoring requirements: Grade 2 with zinc plating and clear chromate, Grade 5 with zinc plating and gold chromate, Grade 5 galvanized, and stainless steel.

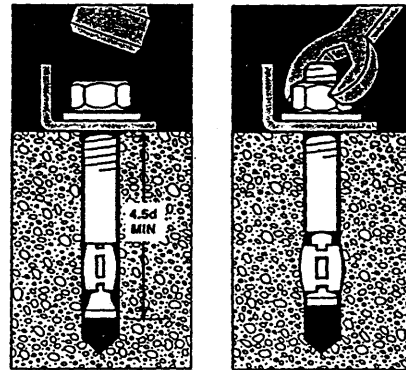
ONE-PIECE STAINLESS STEEL CLIP

Formed around the bolt in one piece, the PARABOLT Concrete Anchor's #304 stainless steel clip won't work loose or fall off during shipping or installation, and provides maximum resistance to corrosion and the pressures of installation.

HOLE SIZE IS BOLT SIZE

The PARABOLT Concrete Anchor eliminates the need to drill an oversized hole, resulting in a minimum volume of concrete removed. This also avoids the confusion of choosing the right drill size.

EASY-TO-INSTALL

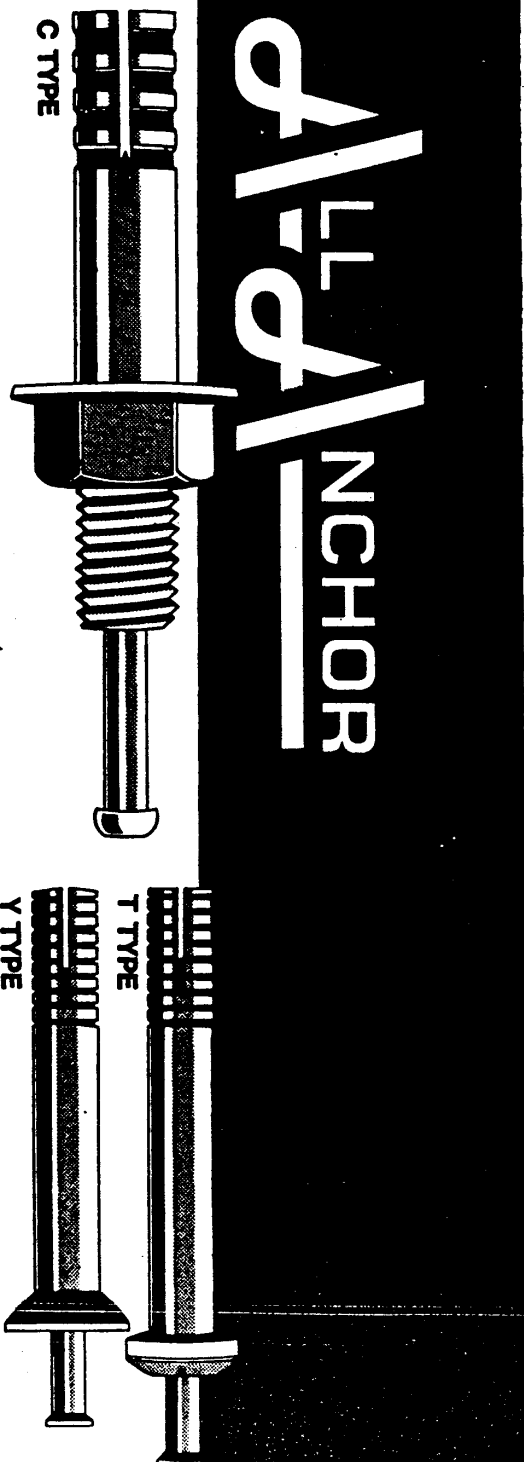


1. Using carbide bit (ANSI B94.12-1977) in same size as bolt diameter (d), drill hole deeper than bolt embedment (minimum 4.5 d). Do not use core bits. Maintain accurate hole size.
2. Clean hole of debris.
3. Add washer and thread nut flush with top of bolt. Drive bolt into hole through item to be fastened.
4. To set, tighten nut three full turns.

SAFETY GOGGLES REQUIRED.

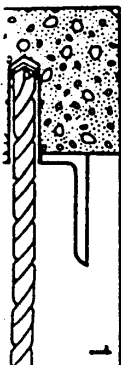
GLOBAL DISTRIBUTING, INC. - Example #1

Sawko ANCHOR *with* QUALITY

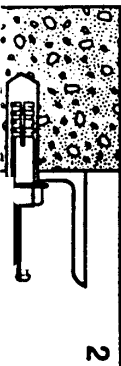


TYPICAL APPLICATIONS: Outlet Boxes • Stadium Seats • Steel Buildings • Wood Plates • Machine Locations • Parking Meters • Wall Hangers • Livestock Equipment • Belt Mountings • Distribution Pane • Bracing • Shelving • Baseboard Heating • Grain Bins

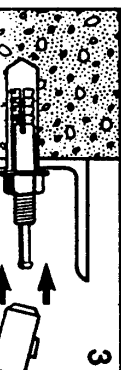
Drill hole to any depth exceeding minimum embedment using the All Drill Bit.



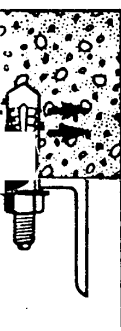
Preset the nut and washer for desired exposure.



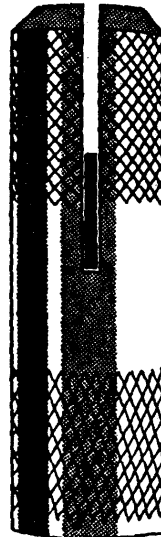
Drive pin flush with the top of All Anchor.



Slotted anchor base expands all four directions.



GLOBAL DISTRIBUTING, INC. - Example #2



TYPICAL APPLICATIONS: Curtain Walls • Wood Sleepers • Roof Flashings • Joists and Beam Hangers
• Duct Straps • Pipe Run Supporters • Conduit Straps • Partitions • Signs

